

# Teaching Assistant Development And Contributions In Online, MOOC, And Blended Synchronous Settings: An Integrative Review

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This is an Accepted Manuscript of an article published by Taylor & Francis Group in *Journal of Further and Higher Education* on 10/03/2022, available online:

<https://doi.org/10.1080/0309877X.2022.2038100>

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To cite this article: Morgan L. Wadams & Kara Schick-Makaroff (2022): Teaching assistant development and contributions in online, MOOC and blended synchronous settings: an integrative review, Journal of Further and Higher Education, DOI: [10.1080/0309877X.2022.2038100](https://doi.org/10.1080/0309877X.2022.2038100)

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# Teaching assistant development and contributions in online, MOOC and blended synchronous settings: an integrative review

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## ABSTRACT

Higher education institutions are expanding the delivery of online and remote learning courses in the context of the COVID-19 pandemic. In turn, numerous challenges are foregrounded for those who are preparing and delivering these courses, including instructors, administrators, and teaching assistants. The purpose of our integrative review was to explore both the roles and responsibilities of teaching assistants in online, blended synchronous learning, and massive open online course modalities, as well as strategies for administrators and instructors to develop teaching assistants in these settings. A systematic search of databases and grey literature produced 1,603 texts; 42 were included for data analysis. We found that teaching assistant roles and responsibilities, as well as strategies to develop teaching assistants, are diverse and often poorly articulated. Roles and responsibilities were dependent upon the teaching assistant's previous pedagogical experiences and comfort level with non-traditional learning environments, institutional leadership, communication by the course instructor and the unique learning environment itself. Strategies to develop teaching assistants were often underdeveloped and influenced by resource constraints and institutional stances towards teaching assistant professional development programmes. Teaching assistant development across the three modalities primarily involved 'on-the-job' training, suggesting a need for further professional development interventions to be designed, delivered and evaluated. Results are synthesised and presented in pragmatic checklists to aid teaching assistants, instructors and administrators with planning and carrying out the three teaching modalities. Our results form the basis of an evidence-informed approach to assist institutions transitioning towards non-traditional learning environments.

## ARTICLE HISTORY

Received 1 October 2021  
Accepted 31 January 2022



## KEYWORDS


Teaching assistants; higher education; online learning; blended synchronous learning; massive open online courses (MOOC)

## Introduction

Higher education institutions have been shifting towards expanding the delivery of online and remote learning courses for an extended period. This shift has been unwillingly fast-tracked by the ongoing global COVID-19 pandemic, which has foregrounded the numerous challenges of preparing for and delivering online and remote learning courses experienced by students, instructors, administrators and teaching assistants (TAs).

While delivering an online course in 2019, we were informed that pragmatic information about delivering online courses with a TA was scarce and often unavailable for instructors, administrators and TAs. Turning to the literature, we found that these concerns reciprocated. Upon learning this, we

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 Supplemental data for this article can be accessed [here](#)

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conducted an integrative review to explore the roles and responsibilities of TAs, along with strategies for TA development to teach and excel in online, blended synchronous learning and massive online open course (MOOC) settings. Thus, in this article, we address the need for a pragmatic understanding of both the roles and responsibilities of TAs in online, blended synchronous learning and MOOC modalities, as well as strategies for administrators and instructors to facilitate TA development in these settings.

## Background

Evolving distance technologies and teaching innovation have led to numerous ways to describe learning in higher education institutions through non-face-to-face classroom settings. As such, we acknowledge that there are multiple and nuanced ways to describe different teaching modalities and strategies, yet for conceptual clarity, our review utilised three 'main' teaching modality terms: online courses, blended synchronous learning courses and MOOCs.

Online courses may be described as a mode of instruction utilising a virtual teaching platform and have traditionally been utilised by students who cannot physically attend campus (Rouamba 2020). These courses are now evolving with increased student enrolments due to their positive attributes, such as increased lifestyle flexibility and potential cost-effectiveness (Arkorful and Abaidoo 2015; Rouamba 2020; Rovai, Ponton, and Baker 2008). Yet, numerous challenges exist when teaching in an online modality, such as a 'different' instructor presence or a potentially depersonalised classroom community (Arkorful and Abaidoo 2015). Along with online courses, other types of distance learning technology and classroom formats have been utilised, such as blended synchronous learning courses.

Blended synchronous learning courses involve utilising distance technologies to enable remote and face-to-face students to simultaneously participate in the same class in real time (Bower et al. 2014; Mayer and Sekayi 2018). These courses provide a greater degree of access equity for students who are geographically isolated or cannot physically attend lectures (Bower et al. 2014; Mayer and Sekayi 2018), such as during pandemics or other catastrophic events (White et al. 2010). In addition, these courses may also reduce the instructor-student ratio, reduce operating expenses and improve the efficiency of running a course (Zhao, Yang, and Li 2019). A challenging feature of blended synchronous learning courses is primarily navigating the cognitive overload and potential interruptions to communication for instructors, TAs and support staff associated with simultaneously delivering a class in real time to both in-person and remote students via sophisticated distance technologies (Bower et al. 2014; White et al. 2010). Whereas blended synchronous learning modalities are functional for small to large course sizes, MOOCs are another non-traditional learning modality that serve high numbers of learners.

MOOCs are free for anyone to enrol and are delivered through dedicated online platforms to 'massive' (i.e. many thousands) numbers of learners (Klobas, Mackintosh, and Murphy 2014). The benefits of MOOCs are predominately the accessibility and nil cost of joining these courses (Ntourmas et al. 2019a). However, the effectiveness of these courses fostering student learning is questionable, as demonstrated by low completion rates of 7–20% (Ntourmas et al. 2019a; Yuan and Powell 2013). Key challenges impacting student completion rates in MOOCs are often the lack of support and interactivity (Kizilcec and Halawa 2015; Ntourmas et al. 2019a). A potential avenue to mitigate these identified challenges is utilising TAs, which have been demonstrated as being instrumental in keeping learners engaged throughout the MOOC (Fischer 2014; Ntourmas et al. 2019b).

TAs may be described as undergraduate or graduate students enrolled in higher education institutions who have knowledge of the course content and are skilled – and developing their skills – in course design, maintenance, administration, and education. Specific definitions of TAs may also vary depending upon the institution, teaching modality, and their roles and responsibilities (Williams 2012). In addition, inherent to a TA's position is their motivation. Although most TAs and faculty

members share a passion for teaching, their individual motivations may differ (Mayer and Sekayi 2018). Faculty may be driven by scholarly productivity within their research field and teaching practices, whereas TAs may be motivated by financial needs or departmental service (Mayer and Sekayi 2018). As higher education institutions shift towards increasing the number of online and remote learning options available, TAs are expected to make this practice shift alongside faculty members.

Higher education institutions have been moving towards increasing the number of online courses available for an extended period. This shift towards online learning has been prompted by discourses of increased accessibility and student enrolment, decreased operating costs/staffing, student self-pacing and individualised learning (Arkorful and Abaidoo 2015; Rovai, Ponton, and Baker 2008; Seaman, Allen, and Seaman 2018). As more students seek online courses, increased numbers of faculty are now required to teach in online or blended learning formats (Sheffield, McSweeney, and Panych 2015). However, as higher education institutions trend towards more non-traditional learning settings in the context of the global COVID-19 pandemic, are most instructors and TAs willing and prepared for these new roles, responsibilities and challenges?

The argument exists, and is well-founded in our personal experiences, that faculty may be resistant to teaching online because of the fear of interacting within a new learning medium and the inevitable disruption to their interpersonal relationships with students (Mitchell, Parlamis, and Claiborne 2015). This resistance extends to administrators, students and TAs as they learn how to interact and deliver courses in a new medium. Key to supporting this transition towards online learning for instructors and students includes training appropriate support staff, such as TAs.

By providing professional development opportunities to prepare TAs to teach in online education modalities, higher educational institutions may begin to address the growth of online courses and support students as well as instructors (Rouamba 2020). Often the training and development of TAs to design, deliver and manage online and non-traditional classes involves short, on-the-job training, which is common practice at some institutions but often insufficient to meet the developmental needs of TAs (Hood and Huang 2013). As such, many TAs are not prepared to teach in their future academic positions, yet alone in an online learning setting (Rouamba 2020).

In response to the lack of available resources surrounding the incorporation of TAs in online and other non-traditional learning settings, the purpose of our review is to critically explore both the roles and responsibilities of TAs in online, blended synchronous learning and MOOC modalities, as well as strategies for administrators and instructors to facilitate TA development in these settings.

## Method

We conducted an integrative review, as outlined by Whittemore and Knafl (2005). The goal of an integrative review is in line with the objective of the research questions, which aim to critique, summarise and interpret heterogeneous sources of information and perspectives (Whittemore and Knafl 2005); for our purpose, this applies to strategies for TA development and contribution in online courses, blended synchronous learning courses and MOOCs.

Our review, as per Whittemore and Knafl (2005), followed five stages: problem identification (as discussed above); data collection, including the literature search; data extraction; data evaluation and data analysis. The research questions this review addressed are as follows:

- (1) What are TA roles and responsibilities in online, blended synchronous learning or MOOC teaching settings by higher education institutions for adult learners?
- (2) What are strategies for TA development in either online, blended synchronous learning or MOOC teaching settings by higher education institutions for adult learners?

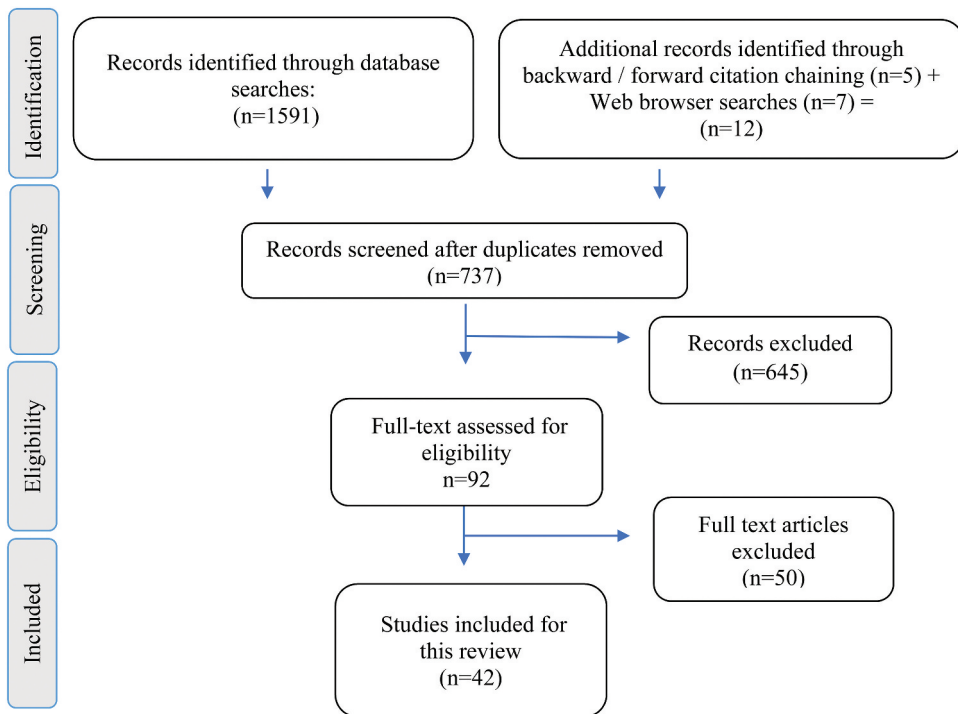


Figure 1. PRISMA flow diagram of literature search.

### Data collection

In line with an integrative review, this review synthesises diverse methodologies used to examine the topic including, quantitative, qualitative and mixed-methods designs (Whittemore and Knafelz 2005). Grey literature sources were included, leading to a reduction in publication bias by including dissenting evidence and perspectives (Mlinarić, Horvat, and Šupak Smolčić 2017). A comprehensive search strategy was initiated in the planning stages of the review.

To identify the relevant literature for this review, and in conjunction with two librarians, we conducted a thorough search of 10 electronic databases. Each literature search and strategy (see Supplementary File 1) was completed with our faculty's librarian and spanned the past 35 years (starting year 1985). In addition, we conducted a web browser search of DuckDuckGo, Google and Google Scholar. A single backward citation chain and forward citation chain of the included texts were completed. The inclusion criteria applied to the title, abstract and full-text screening included the following: sources must refer to some sort of 'teaching assistant' as well as discuss strategies for delivering course content with a TA or strategies to develop TA skillsets within the three modalities. Studies were excluded if they discussed online tutors or in-person teaching settings with online asynchronous activities.

See Figure 1 for the PRISMA flow diagram. After a total of 1,603 results were obtained, titles/abstracts were screened, full-texts were screened and 42 texts were included. The large reduction in texts was predominantly due to either a lack of focus on TAs in these teaching modalities or the sources included in-class settings with online asynchronous components.

### Data extraction

Data extraction was part of the ordering process of data analysis (Whittemore and Knafelz 2005). The overviews created through data extraction simplified and laid the framework for thematic comparisons across the documents during analysis (Whittemore and Knafelz 2005). For key extracted features

of the included texts, see Supplementary File 2. Two independent data extractors (the authors) worked together with both a 10% double review for relevance and a disagreement protocol in place (Mays, Pope, and Popay 2005).

### *Data evaluation*

Because an integrative review includes diverse research designs and has been critiqued for its potential bias, quality assessment becomes a necessary and complicated process (Whittemore and Knafel 2005). We utilised a combination of the Mixed-Methods Appraisal Tool (Hong et al. 2018) and the Joanna Briggs Institute (JBI) critical appraisal checklist for text and opinion papers (McArthur et al. 2015). See Supplementary Files 3 and 4, respectively.

### *Data analysis*

Data analysis followed a constant comparison method as outlined by Whittemore and Knafel (2005). This method converts extracted data into systematic categories, allowing patterns and themes to be created via an inductive approach to analysis (Whittemore and Knafel 2005). Four steps of the constant comparison process of data analysis involved: data reduction, data display, data comparison and conclusion drawing and verification (Miles and Huberman 1994; Whittemore and Knafel 2005).

### *Data reduction*

Data reduction involved organising our extracted data by descriptive categories (e.g. specific teaching modality [online, blended synchronous learning or MOOC], TA roles, TA responsibilities and strategies to develop TAs). Next, we reduced each source's extraction data into a single page, creating a manageable framework for ease of further analysis (Miles and Huberman 1994; Whittemore and Knafel 2005). For the key areas extracted in these reduced sheets, see Supplementary File 2.

### *Data display*

Data display converted the reduced single page into a visual display around certain subgroups or questions, serving as the starting point for interpretation and allowing for the visualisation of patterns and relationships (Whittemore and Knafel 2005). Numerous data displays were then created for each subgroup classification of the integrative review and checked against primary sources.

### *Data comparison*

Data comparison was an iterative process of critically and creatively examining the visual displays to create a conceptual map identifying patterns, relationships and themes (Whittemore and Knafel 2005). We highlighted the differences and similarities of TA roles, responsibilities and strategies to facilitate TA development across the three teaching modalities; we then created a conceptual map that included the majority of identified themes.

### *Conclusion drawing and verification*

The final step, conclusion drawing and verification, moved analysis into small sets of generalisations about the subgroups, such as teaching modalities or type of research design. Areas of conclusion drawing and verification included: (a) formulating TA roles across the three modalities based upon their described responsibilities and roles in primary sources and (b) adopting subgroups of TA responsibilities and strategies to develop them based upon primary text quotes, the chronological flow of course modalities (e.g. before the course begins, at the outset of the course, during the course, midpoint and at the end of the course) and inferences and patterns subsumed from the

specific responsibilities and strategies recommended by the primary texts. We also kept a record (i.e. audit trail) documenting data analysis decisions or alternative hypotheses, reducing bias (Miles and Huberman 1994; Whitemore and Knafel 2005).

## Results

We found that TA roles and responsibilities, as well as strategies to develop TAs, are diverse and often poorly articulated. Our findings are discussed within two general categorisations: descriptive findings and generative findings. Descriptive findings showcase the general trends and frequencies of the field of literature surrounding the roles and responsibilities of TAs and strategies to facilitate TA development across the three teaching modalities. Generative findings outline three forms of synthesis from our integrative review: (a) a taxonomy of TA roles within the three teaching modalities; (b) taxonomies of TA responsibilities across the three modalities, presented in pragmatic checklists for instructors and TAs and (c) strategies to prepare TAs to teach across the three modalities, also presented in pragmatic checklists for instructors and administrators.

### *Descriptive findings*

This section outlines the general study characteristics of the 42 final included texts for data extraction and analysis. For an outline of the general study characteristics extracted, see Supplementary File 2.

#### *MOOCs*

MOOCs formed a distinct learning modality, due to their unique cost structure and extremely high student enrolment (Ntourmas et al. 2019a). Five texts discussed MOOC learning settings, with one study conducted in Mexico, three in Greece and one as unspecified, although the writer conducted an autoethnography based in the United States. TAs were described as unpaid volunteers in four of the five texts. Volunteer TAs were students enrolled in the courses who demonstrated good understandings of the subject matter at the course onset. One study did not specify if TAs were volunteers. Two studies employed qualitative designs, both a case study and an autoethnography, whereas the other three studies employed mixed-methods designs. Publication dates ranged from 2014–2019.

#### *Blended synchronous learning courses*

Blended synchronous learning courses formed a distinct modality because of their unique structure utilising distance technologies to enable remote and face-to-face students to simultaneously participate in the same live class (Bower et al. 2014; Mayer and Sekayi 2018). Four texts discussed blended synchronous learning courses. Two studies were based in the United States: one study reviewed 7 case studies across Australia and New Zealand, and another study was from central China. Teaching assistants were undergraduate students, graduate students, a mix of both undergraduate and graduate students, or unspecified. One study employed a mixed-methods approach, and the other three studies utilised case studies based in quantitative descriptive research. Publication dates ranged from 2010–2019. There was diversity in how blended synchronous learning, or the simultaneous delivery of a lecture to both in-person and online students, was described. Terms included synchronous instruction, synchronous smart classrooms, synchronous learning, polysynchronous class and blended synchronous learning.

#### *Online courses*

Online courses formed the final teaching modality. Overall, 33 texts discussed online courses. Two studies were based in Taiwan, three in Canada, one in China, one in South Africa, one in Hong Kong, 18 in the United States and one in both Taiwan and the United States, and 6 were unspecified but discussed within a North American context. There was a broad diversity of included research designs, ranging from evaluative studies/programme reports to opinion pieces and practice checklists. In 10

texts, TAs were unspecified as their education level (undergraduate or graduate). Eighteen texts referred to TAs as either Graduate Teaching Assistants or had graduate students working as TAs. Only one text utilised undergraduate TAs. Numerous terms referred to online courses: asynchronous fully online courses, online classrooms, online teaching, online learning environments, online virtual fields, remote learning, online flipped classrooms, distance education and online asynchronous learning. Publication dates ranged from 2002–2020.

### *Generative findings*

Roles and responsibilities were dependent upon the TA's previous pedagogical experiences and comfort level with non-traditional learning environments, institutional leadership, communication by the course instructor and the specific learning modality environment. Strategies to develop TAs were often underdeveloped and influenced by resource constraints and institutional stances towards TA professional development programmes. Our findings inform Supplementary Files 5–9 for instructors, TAs and administrators, which span TA roles, responsibilities and strategies for TA development. These files are pragmatic deliverables presenting the primary results of our integrative review. Each is presented in detail below.

### *TA taxonomy of roles*

There was constant interplay between TA roles and responsibilities across the three teaching modalities. A taxonomy of TA roles is depicted in [Figure 2](#), showcasing a comparison of shared and independent roles amongst the three modalities. For a description of TA roles, along with example responsibilities, see [Table 1](#). Roles were identified and described based upon stated roles in the primary texts or explored by extracting TA responsibilities that shaped and informed TA roles. Roles were assigned to either a primary or secondary level. A primary TA role refers to a priority function for the TA to assume in the specific modality. A secondary TA role refers to a dimension to emphasise within the primary role.

Overall, 19 unique roles were gleaned from the included literature, with online courses exhibiting 9 unique roles, blended synchronous learning courses two unique roles and MOOCs one unique role. Seven other unique roles were shared by two or more of the modalities. Roles that were unique to a single modality were often the result of two findings: (a) there was a limited amount of literature on TA roles and responsibilities (e.g. MOOCs), which limited the roles to whatever activities TA responsibilities were focused on or (b) there was an abundance of literature (e.g. online courses), which allowed roles to be expanded upon, both by named roles in the included texts and TA responsibilities shaping and informing further roles.

Seven out of nineteen roles were shared amongst the three modalities in different relationships, speaking to similarities across learning modalities – see [Figure 2](#). Online and MOOC modalities shared a coach role. Online and blended synchronous learning shared four roles, with educator as a primary role for both. However, the remaining three roles (troubleshooter, connector and administrator), although primary roles in an online modality, were included as secondary roles in blended synchronous learning under the support role. Interestingly, yet not surprising, MOOCs and blended synchronous learning courses shared no unique roles, which may be due to their unique instructional settings and TA responsibilities whereby TA's responsibilities in blended synchronous learning modalities did not incorporate discussion forum activities. Finally, all three modalities shared two roles: communicator and facilitator. These roles were identified as primary within online and MOOC modalities, and secondary within a blended synchronous learning modality. A possible explanation for these shared roles amongst the three diverse teaching modalities is the simplicity of these two roles, which capture a significant ethos of a TA's roles and responsibilities in most teaching settings: (a) to send and receive information and (b) to assist with making the course components and processes easier for all those involved.

**Online:**

- Educational Technologist
- Collaborator
- Moderator
- Grader
- Juggler
- Explainer
- Shepherd
- Go-to-person
- Different from faculty

**Blended Synchronous:**

- Support
- Promoter

**MOOC:**

- Motivator

**Online & MOOC:**

- Coach

**Online &**

**Blended Synchronous:**

- Educator
- Troubleshooter
- Connector
- Administrator

**MOOC &**

**Blended Synchronous:**

- No shared roles

**MOOC & Online & Blended**

**Synchronous:**

- Communicator
- Facilitator

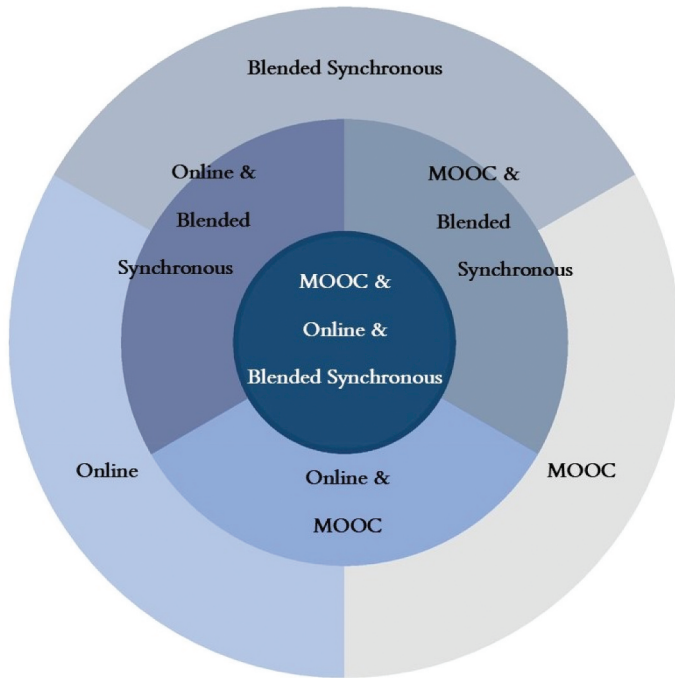


Figure 2. Teaching assistant roles in online, blended synchronous learning and MOOC modalities.

***TA taxonomy of responsibilities***

Our generative findings for a taxonomy of TA responsibilities across the three modalities are presented in the form of pragmatic checklists – see Responsibilities of TAs (Section B) in Supplementary Files 5–7. TA responsibilities amongst the three modalities were primarily synthesised from the texts through two channels: the texts must have *recommended* that the TAs perform the responsibilities, or the texts identified that TAs *explicitly performed* the listed responsibilities.

Within the 42 included texts, we identified 123 unique TA responsibilities in an online learning modality, 26 in a blended synchronous learning modality and 17 in a MOOC modality (see Section B in Supplementary Files 5–7, respectively). Primary texts framed TA responsibilities in relation to time periods in a course (i.e. before the course, during the course, at the course midpoint, at the end of the course and during synchronous activities). If the specific learning modality used synchronous activities, such as online and blended synchronous learning, TA responsibilities were divided into three sections: before the class, during the class and after the class.

Table 1. Teaching assistant roles and functions in online, blended synchronous learning, and MOOC modalities.

Role	Function <sup>a</sup>	Modalities
Educational Technologist Collaborator	Demonstrate competency in computer proficiencies and can navigate, utilise and teach students and faculty in the use of your institution's technologies (e.g. LMS). Work in conjunction with the course instructor, or other institutional support members, on the present and future course schedule, organisation, content and activities.	Online – Primary Online – Primary
Moderator	Monitor the course's online discussion forums and intervene when appropriate to remind students of discussion forum etiquette and to further the dialogue towards the course learning goals.	Online – Secondary to Communicator
Grader Juggler	Grade and evaluate student assignments (Williams 2012), while providing individualised student feedback. Being responsible for and managing a variety of coaching-related tasks (Williams 2012) along with other personal and professional responsibilities (e.g. create an online presence, establish boundaries with students and navigate inter-student conflict).	Online – Secondary to Coach Online – Secondary to Coach
Explainer	Explain and clarify required assignments (Williams 2012), as students are often confused about how to complete assignments or how to incorporate feedback into future assignments.	Online – Secondary to Coach
Shepherd	Provide direction (Williams 2012) and guide students towards course resources, institutional supports and other avenues to streamline and support their learning.	Online – Secondary to Coach
Go-to-person Different from Faculty Support	Act as the first line of support for students, as TAs are often more relatable and available than the course instructor (Williams 2012). The instructor and TA play different roles and responsibilities (e.g. the instructor creates the marking rubric and the TA adheres to it with transparency). Aid the course instructor, students and other staff in whatever ways are appropriate or needed for the course and its activities to successfully achieve student learning outcomes.	Online – Secondary to Coach Online – Secondary to Coach Blended Synchronous – Primary
Promoter	Promote the course aims and objectives throughout the semester, both inside and outside the classroom, while boosting students to actively participate in their learning.	Blended Synchronous – Secondary to Support
Motivator Coach	Motivate students to engage in the course and its activities. Contribute to a supportive environment and assist the students with daily tasks to promote their learning.	MOOC – Secondary to Coach Online – Primary & MOOC – Primary
Educator	Provide instruction or education, as needed and negotiated with the instructor, during the course and its activities.	Online – Primary & Blended Synchronous – Primary
Troubleshooter	Anticipate and be skilled at solving a diverse range of issues within (e.g. audio/visual connectivity) and outside the classroom (e.g. checking weblinks).	Online – Primary & Blended Synchronous – Secondary to Support
Connector	Act as the link between two or more people or things inside and outside the course: connect the instructor to students, students to other students and students to institutional or outside resources (e.g. bring student concerns to your meetings with the course instructor).	Online – Primary & Blended Synchronous – Secondary to Support

(Continued)

Table 1. (Continued).

Role	Function <sup>a</sup>	Modalities
Administrator	Help organise and supervise the ongoing course components and processes (e.g. creating student polls).	Online – Primary & Blended Synchronous – Secondary to Support
Communicator	Send and receive information – via multiple modes of communication (e.g. email) – to and from those involved in the course (e.g. students).	MOOC – Primary & Online – Primary & Blended Synchronous – Secondary to Support
Facilitator	Assist with making the course components and processes easier for students, instructors and other support staff (e.g. monitoring the chat boxes during synchronous activities).	MOOC – Primary & Online – Primary & Blended Synchronous – Secondary to Support

<sup>a</sup>For a comprehensive list of responsibilities, refer to the supplemental texts provided for TAs and instructors.

<sup>b</sup>Primary refers to the role level: a primary TA role is a priority function for the TA to assume in the specific modality.

<sup>c</sup>Secondary refers to the role level: a secondary TA role may be conceptualised as a dimension to emphasise within the primary role, e.g. the promoter role is a dimension for TAs to emphasise within their primary support role.

### *TA development strategies for instructors and administrators*

Strategies for TA development across the three learning modalities were synthesised in the form of pragmatic checklists that may guide instructors and administrators. Section A of Supplementary Files 5–7 showcases TA development strategies in the three modalities for instructors to implement, and Supplementary Files 8 and 9 demonstrate professional development checklists for institutional administrators preparing TAs to teach in online and blended synchronous learning settings.

Specific strategies to facilitate TA development were extracted from the texts via two approaches: the texts either *explicitly* recommended a development strategy, or they *implicitly* discussed a strategy used by an instructor, administrator or TA. In addition to extracting specific strategies, our synthesised results differentiated between the instructor and administrator checklists amongst the three modalities.

**Online courses.** We identified 72 unique development strategies for administrators and instructors to implement that prepare TAs to teach or facilitate an online modality. Of these 72 strategies, 57 are applicable to administrators (see Supplementary File 8) and 15 to instructors (see Section A of Supplementary File 5). Administrators may plan development strategies for TAs in online modalities in five unique ways: (a) professional development sessions, with specific online content areas, student activities and session formats; (b) teaching practicums; (c) technology workshops; (d) mentorship opportunities and (e) institutional shifts (see Supplementary File 8). The 15 development strategies for instructors to implement are actions the instructor can take before the course and throughout.

**MOOCs.** 7 unique TA development strategies are identified in our review for a MOOC modality (see Section A of Supplementary File 7). All 7 strategies are actions that instructors may take before and during the MOOC to prepare and facilitate TA development. For example, before the MOOC begins, the instructor should create clearly defined instructions and objectives for any course activities that the TAs will assist with. There were no development strategies identified for administrators involved with MOOCs.

**Blended synchronous learning courses.** In our review, we identified 8 unique TA development strategies for a blended synchronous learning modality. Four development strategies are applicable to administrators (see Supplementary File 9), and four strategies are for instructors (see Section A of Supplementary File 6). The development strategies for administrators to consider involve different professional development sessions to prepare TAs to facilitate the delivery of a blended synchronous learning modality (see Supplementary File 9). The four development strategies for instructors to implement are actions that the instructor can take before and during the course (see Section A of Supplementary File 6).

Overall, these five checklists are meant to act as a prompt to think about ways to alter either an instructor's practices or an administrator's institutional practices and professional development programmes that prepare TAs for their present and future roles in online, blended synchronous learning and MOOC modalities.

## **Discussion**

The findings of our review contribute to the higher education discipline in numerous ways: (a) they provide an overview of the knowledge in the field of TA's roles and responsibilities, along with strategies to develop them, in the three identified modalities; and (b) they offer significant practice guidance to instructors, TAs and administrators involved in planning and delivering the three learning modalities. Our discussion explores these contributions in further detail.

### *Future areas for growth in the field*

The shift towards online and other non-traditional learning modalities has been unwillingly fast-tracked by the ongoing global COVID-19 pandemic, which foregrounds the numerous challenges experienced by students, instructors, administrators and TAs when delivering online and remote learning courses. Understanding key areas for growth, in relation to TAs, from a critical lens in these fields is important and provides direction for future work and development.

#### *Conceptual clarity*

In our review, we acknowledge the multiplicity of terms describing different, yet similar, teaching modalities. We have focused and described three 'main' teaching modality terms referring to non-traditional environments: online courses, blended synchronous learning courses and MOOCs. As our review progressed, numerous terms arose that described learning in higher education institutions through non-traditional learning settings. As such, we perceived a degree of conceptual confusion. When instructors and administrators turn to the literature to prepare courses to transition into online or other non-traditional learning modalities, confusion may arise, and thus, individuals should know what words to apply to the course delivery to avoid misconceptions. In summary, we see both need and opportunity for conceptual clarity within higher education fields to describe online and blended synchronous learning modalities in consistent terms.

#### *TAs in blended synchronous learning*

Blended synchronous learning courses can enact collaborative evaluation, group questioning, collaborative problem solving, role-play, whole-class discussions and collaborative design tasks (Bower et al. 2014). Yet even with these positive attributes, there is a lack of work conducted, in general, around TAs roles and responsibilities. For example, only four studies discussed TAs in relation to blended synchronous learning modalities, with most roles synthesised from inferred responsibilities extracted from the texts.

A future area for growth is the almost absent field of literature surrounding strategies to develop and prepare TAs to teach and support blended synchronous learning modalities, as noted by the limited information provided in Supplementary File 9 and Section A of Supplementary File 6. Current research has predominantly focused on the responsibilities of TAs within a supporting role (Bower et al. 2014), with minimal to no work exploring how TAs may learn to teach or lead blended synchronous learning activities. As of now, the ways in which distance technologies are utilised determine the extent to which students perceive a sense of community presence, communication and sharing between in-person and online students (Bower et al. 2014). In addition, the depth of student learning is dependent upon the pedagogies utilised in blended synchronous learning settings (Bower et al. 2014). Given that a key challenge identified in this modality is the cognitive overload and interruption to communication for instructors, TAs and support staff, TAs would benefit from learning and demonstrating skill sets related to distance technologies, blended synchronous learning task design and pedagogies applicable to this modality.

#### *TAs in MOOCs*

There is a general lack of work conducted around TAs roles and responsibilities in MOOCs, with almost no suggested strategies to develop TAs. For the sheer number (up to 800) of TAs required to facilitate a MOOC, articulation of TA responsibilities and conceptual roles is surprisingly absent. For example, of the four identified TA roles in MOOCs, only two were stated in the included literature with the remaining two roles analysed from the TA's responsibilities. A possible explanation for the limited work conducted around TA roles and responsibilities in MOOCs is the 'confined' setting of a MOOC, which tends to forefront discussion forums as the primary medium for inter-student interactions. Because inter-student interactions occur in discussion forums, this becomes the focus of a TA's responsibilities in this modality and, as such, the focus of the literature.

### *Practice recommendations*

The purpose of our review was to critically explore both the roles and responsibilities of TAs in online, blended synchronous learning and MOOC modalities, as well as strategies for administrators and instructors to develop TAs in these settings. Practical contributions of our review include:

- a taxonomy of TA roles and responsibilities in online, blended synchronous learning and MOOC modalities to be utilised by instructors and TAs (see Section B in Supplementary Files 5–7);
- recommendations for administrators to implement into new, or existing, TA professional development programmes to prepare TAs to effectively support the delivery of online and blended synchronous learning courses (Supplementary Files 8–9); and
- a list of strategies for instructors to implement before and during their online course, blended synchronous learning course or MOOC to support TAs with a positive and successful teaching and learning experience (see Section A in Supplementary Files 5–7).

We outline further recommendations below to aid instructors, TAs and administrators navigating the supplementary files.

### *TA roles and responsibilities*

When planning for any of the three teaching modalities, first identify what teaching modality will be utilised with a TA and then select the corresponding checklist (Supplementary Files 5–7). While navigating the checklists, there is an emphasis on the discussion, negotiation and documentation about what roles and responsibilities the TA will assume in the course. The checklists are not exhaustive of all TA responsibilities and strategies for development in the three modalities, but are meant as a ‘touchstone’, to open a discussion between instructors and TAs about TA responsibilities and strategies for their development in a class. Course instructors should reflect on their preferred frequency, depth and method(s) of communication with TAs. Another consideration is selecting the ratio of TAs to students within the three modalities. In online and MOOC modalities, there was no guidance on this ratio. For blended synchronous learning, it was identified that the amount of assistance required was about 30 students to each TA (Bower et al. 2014; White et al. 2010).

The roles and responsibilities by TAs in the three modalities are multidimensional and challenging. TA roles and responsibilities depend on numerous factors, such as individual faculty preference, departmental policies or TA prior teaching experience (Hood and Huang 2013). When thinking about the potential roles for TAs to assume in the three modalities (see Table 1.), understand that each TA experience will be unique, but it is important to forefront that the instructor and administrator’s role is to contribute to an overall positive learning experience for TAs.

### *Strategies to facilitate TA development*

When planning strategies to facilitate TA development during courses or by professional development interventions, identify what teaching modalities the TAs will be preparing for and select the corresponding checklist for instructors (Supplementary Files 5–7) or administrators (Supplementary Files 8–9). The checklists may be utilised as a prompt to think about ways to alter an instructor’s course practices or institution’s practices and professional development programmes preparing TAs for their present and future roles in non-traditional learning modalities. However, some of these preparations may not be applicable to specific instructors, institutions or professional development programmes.

Online teaching has an additional layer of difficulty as TAs learn to interact and facilitate courses in a new medium. However, providing student TAs with the opportunity to learn and receive training about online teaching can change their perceptions and often negative assumptions about remote teaching and learning (Rouamba 2020). Unfortunately, the included literature did not address ways to improve TAs perceptions towards blended synchronous learning or MOOCs. Overall,

administrators and instructors planning strategies to facilitate TA development during courses or by professional development interventions may encourage TAs to see face-to-face, blended and online teaching on a spectrum of effective approaches available, although meeting different needs in different contexts (Sheffield, McSweeney, and Panych 2015).

### *Future research agenda*

Numerous areas for future research are identified in this review. We specifically address professional development programmes/interventions for TAs and the compensation model.

### *Professional development programmes or interventions for TAs*

'On-the-job' TA training is a second-rate strategy, and more resources could be mobilised and delivered to prepare TAs for their diverse roles and responsibilities within online, blended synchronous learning and MOOC modalities. As the COVID-19 pandemic unfolds, instructors and administrators are looking for both pedagogical strategies to teach online and strategies to support students in online learning (Johnson and Veletsianos 2020). If instructors and administrators are looking for further guidance, it is reasonable to suppose that TAs are seeking this as well. However, existing TA development interventions related to these learning environments are often limited to a small module or single session even though non-traditional modalities make up a significant component of a TA professional practice. Given that TAs are instrumental in supporting the planning, delivery and evaluation of non-traditional learning modalities alongside instructors and administrators, further professional development interventions preparing TAs for these modalities could be designed, delivered and evaluated. For example, in blended synchronous learning courses, professional development strategies focused on pre-service and in-service training and support to prepare TAs may be accommodated into existing, or new, university-wide training programmes (Mayer and Sekayi 2018; Zhao, Yang, and Li 2019). A key area of future research may also involve programme evaluation that integrates measurable outcomes (i.e. programme costs, course completion rates, student satisfaction and student learning outcomes) and participants' experiences (TAs and students of TAs).

### *Compensation model*

Professional development interventions offer valuable learning experiences that highlight the theoretical and practical experiences that may prepare TAs for their future careers (Bourelle, Bourelle, and Rankins-Robertson 2015). Planning and implementing professional development interventions for TAs, faculty, or other support staff may be a complicated and costly endeavour, requiring significant amounts of financial and human resources. To complicate matters further, TAs may not be motivated, in general, to participate in voluntary teaching or staff-development programmes.

In our review, some scholars identified that it is important to provide appropriate financial compensation to TAs enrolled in professional development sessions, whereas others offered certificates at the end of the professional development programme/session or made completing the professional development programme worth 3-credit hours. Compensation can come in other forms outside of financial, and as higher education institutions feel, the monetary constrictions of shrinking budgets and the simultaneous expectation to provide similar, or superior, student learning outcomes and appropriate avenues to compensate TAs for their time are a challenging task forefronted within the literature. We also expect, and understand, that TAs dedicate some of their full-time hours towards professional development in the advancement of their pedagogical careers. As such, we recommend that further work explores appropriate compensation models for professional development interventions that may strike a balance between fairly compensating TAs for their time, motivating TAs to pursue professional development opportunities outside of their on-the-job training and institutional constraints and resources. What should remain at the forefront of these

professional development interventions are practical experiences that contribute to a TAs personal and professional growth. In the context of MOOCs, we acknowledge that due to their the funding model (i.e. nil course fees), financial compensation for TAs would be unrealistic.

### Limitations

Study limitations should be considered when thinking about replicating or expanding this review. Our first limitation relates to the conceptual clarity of search terms. In the field of non-traditional teaching settings, such as online courses, blended synchronous learning courses or MOOCs, terms have not been utilised consistently, applied in ways they are not meant to be, or referred to in different ways. Ultimately, some terms in our review may be missing, even though we completed two searches (one in 2019 and one in 2020) with two librarians. However, given that the goal of an integrative review is to summarise diverse sources and perspectives of information, our results serve as a robust starting point for instructors, TAs and administrators.

Our second study limitation is inherent with integrative reviews, which is the risk of conducting the work in a biased, inaccurate or non-rigorous manner (Beck 1999). In order to mitigate these criticisms, numerous steps were taken when planning and conducting the review: (a) grey literature sources, such as editorials, commentaries, conference abstracts and dissertations were included, which can lead to a reduction of publication bias by including dissenting evidence and perspectives (Mlinarić, Horvat, and Šupak Smolčić 2017); (b) a PRISMA flow diagram (Figure 1) was utilised, which demonstrated studies included/excluded at each stage; (c) two independent data extractors and appraisers with a disagreement protocol in place worked together during data extraction and quality appraisal (Mays, Pope, and Popay 2005) and (d) an audit trail was kept to document data analysis decisions or alternative hypotheses (Miles and Huberman 1994; Whittimore and Knafl 2005). Overall, numerous steps were taken to reduce bias and criticisms of non-rigorous steps in our integrative review.

### Conclusion

Our integrative review, as a critical review approach, explored, analysed and critiqued diverse sources of evidence to understand the roles and responsibilities of TAs, along with strategies to facilitate TA development, within online courses, blended synchronous learning courses and MOOCs. Our results were translated into pragmatic checklists to be utilised by instructors, administrators and TAs involved with planning and delivering these modalities. We found that TA roles and responsibilities were dependent upon the TA's previous pedagogical experiences and comfort level with non-traditional learning environments, institutional leadership, communication by the course instructor and the unique learning environment itself. Strategies to develop TAs were often underdeveloped and influenced by resource constraints and institutional stances towards professional development programmes. As institutions shift to non-traditional teaching modalities in light of the COVID-19 pandemic, this review provides evidence-based recommendations to take into consideration. General recommendations include advertising and utilising the correct learning modality terminology, planning for that modality and training TAs accordingly. The advanced technologies, tools and methodologies at our disposal in higher education settings should not serve as the panacea for communicating in a new medium via online or remote learning. Rather, these advanced methods may be paired with adequately preparing and supporting instructors, TAs, administrators, students and support staff for these ongoing advances in the field of remote teaching and learning.

### Acknowledgement

We are grateful to Dr. Derek Sellman, PhD, RN, for providing feedback on a final version of our manuscript.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## Funding

This research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

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