Designing for Engagement: Exploring Task Workload and Interaction in an Online Professional Development Course for Teachers

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Abstract

This paper investigates the task workload experienced by teachers in an online professional development course, analyzed through the lens of Moore's Theory of Interaction. The study examines how different forms of interaction such as learner-content, learner-instructor, learner-learner, and learner-interface shape teachers' perceptions of workload. The online course was introduced through an in-person orientation workshop that familiarized participants with registration, login, and navigation procedures. Teachers completed the NASA-TLX questionnaire at the beginning and end of the course, defining the task as the completion of all modules leading to certification. To complement quantitative data, unstructured interviews with selected participants provided qualitative insights into perceived workload, challenges, and suggestions for improvement. Findings from the study revealed that teachers experienced moderate workload across several dimensions, including mental effort, physical interaction, temporal pressure, and emotional strain. These results highlight the significant influence of course design, task complexity, and interface usability on teacher engagement in digital professional development contexts. The findings emphasize the crucial role of well-designed interactions in managing workload and maintaining learner engagement in online learning environments.

Keywords: digital learning, task workload, interaction theory, teacher experience, user experience, interaction techniques, learner engagement

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Introduction

e-Learning, broadly defined as an interactive mode of instruction delivered through digital platforms (Paulsen, 2002), has emerged as a widely adopted strategy in professional development programs. It provides a flexible and scalable framework for supporting lifelong learning and extending access to formal education (Mason & Rennie, 2006). Key advantages of e-learning include its capacity to accommodate self-paced learning, promote learner autonomy, encourage self-reflection, and facilitate collaboration within dynamic digital environments.

However, alongside these benefits, several challenges have been consistently identified in literature. A frequently cited limitation is the reduced opportunity for social interaction and interpersonal communication due to the lack of face-to-face engagement (Kear, 2010). This can lead to feelings of isolation and disengagement, particularly in courses that do not provide peer collaboration or instructor presence.

In addition, for learners who are less familiar with digital technologies, the process of navigating online learning environments can introduce significant interface-related challenges. Complex or unintuitive user interfaces may increase the physical and mental effort required to complete tasks, contributing to task overload and negatively impacting the learning experience. These usability-related barriers, when combined with the intrinsic complexity of learning tasks, can intensify perceived workload across multiple dimensions such as mental demand, effort, and frustration.

While prior studies have explored learner engagement and cognitive load in e-learning environments, there is limited empirical research examining how different types of interaction, particularly learner–interface interaction specifically influence task workload in teacher professional development contexts. This gap is particularly relevant as online professional development often involves both structured content and platform-mediated interaction, requiring learners to navigate and engage independently. Moreover, as education systems increasingly turn to online modes to deliver technical content, the design of effective learning environments and resources becomes critical for engaging both teachers and learners. This need is especially pronounced in countries like India, where teachers are not yet fully equipped to integrate digital components into the curriculum, even as substantial efforts are underway to build this capacity. Institutions such as UNESCO MGIEP are leading this shift, offering professional development courses through hybrid, fully online, and workshop-based formats. These courses include a variety of training modules designed to engage both educators and students.

The present study draws on Moore's Theory of Interaction (Moore, 1989) to examine how different forms of interaction namely learner–content, learner–instructor, learner–learner, and learner–interface affect the perceived task workload in "The Digital Educator: A Primer", an online professional development course for teachers. This course is hosted on "FramerSpace", UNESCO MGIEP's digital learning platform.

Literature Review

Daniel et al. (1982) suggests that all educational transactions exist along an interaction continuum, with learner-instructor interaction at one end and learner-content interaction at the other. Building on this, Anderson (1987) and Keegan (2013) emphasize that meaningful

interaction is essential for effective learning and knowledge exchange. Moore (1989) further categorizes interaction in distance education into three distinct types. The first is learner-content interaction, defined as intellectual engagement with content that facilitates changes in the learner's understanding, cognition, or perspectives. The second is learner-instructor interaction, which involves the instructor's role in motivating, guiding, and clarifying misunderstandings for the learner. The third type is learner-learner interaction, which refers to communication among learners, either individually or in groups, and may occur with or without the real-time presence of an instructor.

As technology becomes increasingly central to mediating learning interactions, the design and functionality of educational tools take on higher importance. Garrison (1989) observes that while the medium may not fundamentally alter the nature of communication, it significantly shapes how learners perceive and experience that communication. Building on Moore's well-established framework of interaction comprising learner-content, learner-instructor, and learner-learner Hillman et al. (1994) introduced a fourth dimension: learner-interface interaction. This refers to how learners engage with the technological medium itself, which serves as a prerequisite for accessing all other forms of interaction.

This paper critically examines all four forms of interaction namely learner-content, learner-instructor, learner-learner, and learner-interface within the context of the online professional development course "Digital Educator – A Primer", designed specifically for school teachers. While prior research has highlighted platform features such as gamification, scaffolded interactivity, and learner-centered pacing as key contributors to engagement and performance (Silverajah & Govindaraj, 2018; Wang et al., 2021), these studies have not specifically examined how such platforms impact teachers in professional development settings (Feng & Sun, 2021). Our study addresses this gap by measuring perceived workload using the NASA-TLX (Hart & Staveland, 1988) instrument, providing a focused understanding of the cognitive and physical demands experienced by educators during online training.

Findings from our analysis reveal that teachers experience moderate workload across multiple dimensions such as mental demand, physical demand, temporal pressure, effort, performance, and frustration when interacting with the course platform. This suggests that while the platform fosters learning engagement, it may also impose some cognitive and interface-related demands that hinder effective interaction.

To address these challenges, we propose a set of user-centered design enhancements, including simplified navigation, real-time feedback, and modular task structures, aimed at reducing unnecessary effort and improving the overall usability of the platform. These recommendations build upon previous research but move the focus from engagement features alone to include the usability and workload impact of learner-interface interactions thus offering a more comprehensive approach to EdTech design in professional development settings.

Study Design

Course Overview

"The Digital Educator – A Primer" course is structured around five key quests designed to equip teachers with the knowledge and skills to integrate digital pedagogy effectively. Module 0 - Quest 0 (Introduction) sets the stage by familiarizing participants with the course

design and encouraging reflection on their comfort with technology, emphasizing a neuroscience-informed whole-brain approach to learning. Module 1 – Quest 1 (Understand Digital Pedagogy) explores learner variability and introduces digital pedagogy as a means to create inclusive, engaging learning experiences that are responsive to diverse student needs. Module 2 – Quest 2 (Design Learning Experiences) delves into Universal Design for Learning (UDL) principles and demonstrates how digital tools can be used to overcome learning barriers by offering multiple means of engagement, representation, and expression. Module 3 – Quest 3 (Navigate the Digital Space) focuses on digital citizenship, helping educators understand the importance of online identity, safety, and ethical behavior in digital environments. Finally, Module 4 – Quest 4 (Hybrid Learning Environments) explores how to effectively design hybrid (blended) learning by balancing online and in-person teaching strategies. Module 5 – Quest 5 (Reflect and Share Your Learning) provides an opportunity for participants to reflect on their learning journey, complete assessments, and consider how to continue applying digital strategies in their professional practice. Together, these quests promote a thoughtful, inclusive, and purposeful use of technology in education.

Participants

The study involved 30 teachers (both male and female) from a well-established English-medium school, with ages ranging from 25 to 50 years. Prior to participation, informed consent was obtained from each individual. The study received ethical clearance from the institution's review committee.

Procedure

The course was introduced to the participating teachers through a brief in-person orientation workshop. During this session, participants received step-by-step guidance on registering, logging into the FramerSpace platform, and enrolling in the course. The course itself was designed to be fully online and self-paced, allowing learners to progress independently through the modules. In this study, the task is defined as the completion of all course modules and the successful generation of a course certificate. Participants completed the NASA-TLX questionnaire prior to the commencement of the first module. Upon completing all modules, they were again asked to complete the questionnaire to report their perceived task workload. The FramerSpace platform also provided learners with access to a learner's dashboard, enabling them to monitor their progress and view individual scores for each completed module. Technical assistance was available as needed, primarily to resolve access-related issues such as login difficulties. To gain deeper insights into the learner experience, a series of unstructured one-on-one interviews were conducted with a selected subset of participants after they completed the course. These interviews explored several dimensions of the learning experience, including perceived workload, challenges encountered, and suggestions for improving different types of interaction within the course. By integrating quantitative data from the NASA-TLX with qualitative insights from participant interviews, this study enabled a comprehensive understanding of teachers' experiences with the course content and the digital learning environment.

Data Collection

The NASA Task Load Index questionnaire was employed to assess the perceived task workload at both the beginning and the completion of the course. Participants rated six subscales which are the mental demand, physical demand, temporal demand, effort,

performance, and frustration on a 5-point Likert scale ranging from 1 (very low) to 5 (very high). The mental demand subscale referred to the extent of mental and perceptual activity required (e.g., thinking, deciding, calculating, remembering, searching, reading course materials, and reflecting). Physical demand captured the level of physical activity involved in interacting with the course (e.g., navigating menus, clicking, scrolling, and operating interface features). Temporal demand assessed the perceived time pressure experienced due to the pace and flow of tasks and activities within the course. Effort measured the degree of mental and physical exertion required to complete the course tasks while maintaining performance. The performance subscale reflected the participants' perceived success in accomplishing course goals and their satisfaction with their outcomes. Frustration examined the extent of negative emotional responses such as stress, irritation, discouragement, or insecurity experienced during the course.

Table 1 and Figure 1 below show the task workload for each of the subscale. After normalization, the overall task workload after completion of the task was calculated to be 56.94. According to the classification proposed by Ernawati et al. (2019), this value corresponds to a moderate level of task workload.

Table 1
Perceived Task Workload

NASA TLX TASK WORKLOAD				
Subscales	***Beginning of the Course***		***After Completion of the Course***	
	Mean	***SD***	***Mean***	***SD***
Mental Demand	15	18.41	56.66	24.94
Physical Demand	21.66	18.58	55	22.73
Temporal Demand	25	16.36	58.33	19.72
Effort	26.66	14.84	56.66	21.34
Performance	13.33	12.9	58.33	23.57
Frustration	15	12.67	56.66	23.21
Total	19.44	5.376	56.94	19.89

Statistical analysis using the Mann-Whitney U test revealed significant differences across all six subscale and the overall workload:

Mental Demand: U = 23.00, p = .0001, r = .68 (large effect). The course required considerable concentration and decision-making, suggesting a cognitively intensive experience. While such demands are common in professional development, overly high levels may overwhelm some learners, indicating the need for refinement at both the platform and instructional design levels.

Physical Demand: U = 31.00, p = .0005, r = .62 (large effect). Learners reported a notable increase in physical interaction, reflecting tasks such as frequent navigation and engagement with interactive elements.

Temporal Demand: U = 22.50, p = .0001, r = .68 (large effect). Participants reported increased time pressure, potentially due to course pacing, tight deadlines, or competing personal obligations.

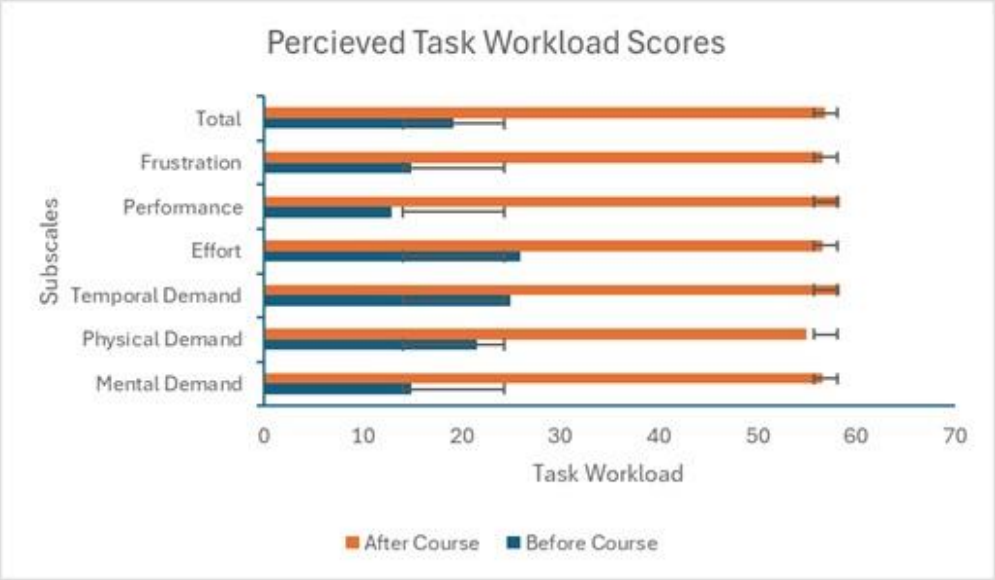
Effort: U = 27.50, p = .0002, r = .64 (large effect). The findings indicate that learners exerted substantial mental and physical effort to complete course activities.

Performance: U = 11.50, p < .0001, r = .76 (large effect). A significant change was observed in perceived performance, with some learners feeling they underperformed or struggled to meet expectations.

Frustration: U = 12.00, p < .0001, r = .76 (large effect). The results point to increased frustration levels, possibly linked to unclear instructions, lack of feedback, or technical difficulties.

Total Perceived Task Workload: U = 14.00, p < .0001, r = .75 (large effect). The overall perceived cognitive load significantly increased following the course.

Figure 1
Subscales and Task Workload



In summary, while the course was cognitively engaging and aligned with the goals of professional development, the consistently elevated workload across dimensions highlights areas for improvement. Refining course design and platform usability could help reduce unnecessary task load and better support learner performance and satisfaction. The results show that there is a need to balance course rigor with usability. Platforms must support teachers by minimizing unnecessary effort through thoughtful design such as chunking content, reducing interface complexity, integrating help systems, and allowing flexible pacing. These enhancements not only reduce cognitive overload but also promote sustained participation and successful skill transfer to classroom settings. Hence, for online teacher professional development programs to be effective and sustainable, EdTech platforms must prioritize user-centered design that considers teacher workload. By addressing issues of usability, cognitive demand, and emotional experience, such platforms can better support teacher learning and foster long-term adoption of digital tools in education.

Findings and Discussion

We analyzed the course using Moore's theory of interaction (Moore, 1989), along with Hillman et al., (1994) learner-interface interaction and have found several strengths as well as areas for improvement across different subscales of task workload.

Learner–Content Interaction was a key strength of the course. The use of multimedia elements including videos, quizzes, reflective tasks, readings, and case studies facilitated deep engagement with digital pedagogy and the principles of Universal Design for Learning (UDL). The modular, self-paced structure supported autonomy, while scenario-based questions and curated toolkits enriched the learning experience. However, the inclusion of lengthy videos increased the perceived task load, as noted by several participants. One participant remarked, "It would be better if the videos are cut short as they are too long". Segmenting videos into shorter, digestible units could reduce cognitive overload and enhance learner retention. Many participants also recommended shortening the modules so that each focused on a single topic. They noted that this would reduce *mental demand* and *effort* and help minimize *frustration* associated with processing multiple concepts within a single module.

Learner–Instructor Interaction was present but limited in scope. While instructional intent was conveyed through embedded videos, quiz having predefined questions and answers, and reflective prompts, opportunities for real-time guidance or personalized feedback were minimal. Several learners expressed uncertainty about whether their responses were acknowledged or recorded. As one participant noted, "Though I spent time answering the question, I didn't get any feedback, so I wasn't sure if my answers were recorded or not". This lack of responsive communication likely contributed to increased *frustration* and *mental demand*, as teachers were left uncertain about their progress and the validity of their efforts. To address this, the inclusion of periodic synchronous sessions, moderated discussion threads, or automated feedback systems could help strengthen learner–instructor interaction and ease the associated workload stressors.

Learner–Learner Interaction, although collaborative tools such as Padlet were made available, they were largely underutilized, resulting in limited opportunities for peer dialogue, cooperative learning, and shared knowledge construction. According to Moore, this form of interaction is essential for fostering a sense of community and supporting social learning. One participant remarked, "I did not know the need of the discussion forum, as I did not see any comments or questions or threads in that section". The absence of peer engagement may have contributed to increased *mental demand* and *frustration*, as learners navigated complex content in isolation without the cognitive or emotional support of a learning community. Future iterations of the course could benefit from integrating active peer discussion forums, collaborative assignments, and structured peer feedback mechanisms to promote deeper engagement and reduce perceived workload.

Learner–Interface Interaction, as conceptualized by Hillman et al. (1994), played a significant role in shaping the overall learning experience. The digital learning platform offered supportive features such as dashboards, progress tracking, embedded tutorials, and emotional check-ins, all of which facilitated self-regulation and reduced initial navigation load. These elements helped ease *mental* and *temporal demands* in the early stages of the course. However, participants also encountered several usability challenges that disrupted their interaction with the system. Difficulties included remembering unique login IDs,

inconsistencies in resuming course progress, and technical issues with embedded forms. One participant noted, “I wanted to submit the form, but I got lost as I was taken to the next module”. Additionally, the “Resume” feature failed to return learners to their last active point, requiring them to manually retrace their steps. These usability friction points likely increased *effort*, *physical demand*, and *frustration*, particularly among novice users. These findings underscore the importance of intuitive user flow design and accessible interface features, especially in courses that emphasize inclusive and learner-centered design principles.

The results of the NASA-TLX analysis revealed that teachers experienced moderate workload across multiple dimensions indicating high mental effort, physical interaction, temporal pressure, and emotional strain while navigating the online course. These findings underscore the need to redesign both the platform and the course to better align with the actual needs and constraints of educators participating in professional development.

To address these issues and improve overall usability, we *recommend* (a) Simplify course navigation and structure to help teachers move through content effortlessly and reduce confusion. (b) Streamline user interactions by minimizing repetitive tasks and optimizing platform responsiveness. (c) Allow flexible pacing and personalized learning paths to accommodate teachers’ varied schedules and workloads. (d) Provide in-context guidance and on-demand support to assist teachers during complex or unfamiliar tasks. (e) Deliver immediate and clear feedback on activities to help teachers track progress and build confidence. (f) Maintain transparent communication and responsive support systems to quickly address user concerns. (g) Design content using microlearning principles to avoid overload and ensure each module contributes meaningfully to professional growth.

Conclusion

This study examined how interaction design influenced task workload in an online professional development course for teachers. Utilizing the NASA-TLX instrument, the overall task workload for course completion was assessed, revealing particularly moderate scores in mental demand, performance pressure, and temporal demand. Interpreting these findings through the lens of Moore’s Theory of Interaction, the analysis highlighted that limited learner–learner interaction, delayed and inadequate feedback, and interface usability issues were key contributors to increased mental effort and frustration. These results point to the need for revising both the course structure and the digital platform by enhancing instructor responsiveness, integrating more robust social learning features, and improving platform navigation. We firmly believe that strengthening these elements will improve the quality of the learning experience and also support continuous participation and engagement of teachers in online professional development, ultimately contributing to more effective and scalable capacity-building in the education sector.

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