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Enhancing Instructional Effectiveness through Digital Learning Objects: Voices from Contract of Service (COS) teachers in Malaysia

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Abstract
This study investigates the role of Digital Learning Objects (DLO) in improving instructional effectiveness among Malaysia's Contract of Service (COS) teachers. Using the Nominal Group Technique (NGT), 13 primary school teachers evaluated five components of the DLO. Online assessments and learning platforms were rated as the most useful. All components were deemed suitable for classroom integration, highlighting their relevance in digital teaching. The findings suggest that DLO can help novice teachers address instructional challenges, particularly in underserved areas. The study recommends further research and the development of targeted digital support strategies to enhance the teaching experiences of COS educators.

Keywords: Digital Learning Objects, Contract of Service Teachers, Educational Technology, Nominal Group Technique

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1.0 Introduction

In the era of rapid digital transformation, education has undergone a paradigm shift through the integration of technology into teaching and learning processes. Digital Learning Objects (DLO), such as instructional videos, audio-based learning, online assessments, learning platforms, and mobile applications, have become essential tools for enhancing instructional effectiveness, particularly among school teachers (Idera & Abdullah, 2024). DLO not only diversifies the methods of content delivery but also supports newly appointed novice teachers in addressing the diverse needs of students within dynamic learning environments. Teachers appointed under the Contract of Service (COS) scheme fall within the novice teacher category. They play a critical role in Malaysia's education system, especially in addressing teaching demands in underserved or teacher-shortage areas. However, these teachers often face challenges such as time constraints, limited access to training resources, and the need to adapt quickly to emerging educational technologies (Halim & Ghani, 2025). In this context, DLO offers significant potential to enhance the effectiveness of teaching and learning by delivering content that is interactive, flexible, and easily accessible (Shanmuganathan & Nasri, 2025). Therefore, this article aims to investigate

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the use of DLO among COS teachers and examine its impact on instructional effectiveness. This study aims to contribute to the development of more effective support strategies for COS teachers in the digital era of education.

2.0 Literature Review

DLO have emerged as essential components in modern educational practices, primarily due to their inherent characteristics of reusability, portability, and self-containment (Ülker et al., 2021). These attributes make DLO particularly valuable in diverse teaching and learning contexts, allowing content to be deployed efficiently across multiple instructional settings. Poultsakis et al. (2021) define DLO as structured units of digital content purposefully developed to support learning by aligning with curriculum goals. The designers structured them to be modular and adaptable, enabling seamless integration into various Learning Management Systems (LMS) and facilitating delivery through diverse technological mediums such as video, audio, interactive simulations, and assessments.

Building on this, Topali and Mikropoulos (2019) define DLO as pedagogically complete and discrete learning units that educators can reuse and repurpose to fit different learning scenarios. This modularity and pedagogical coherence enable educators to tailor DLO to meet the specific needs and preferences of individual learners, thereby supporting personalised and differentiated instruction. Such adaptability not only enhances student engagement but also promotes deeper cognitive processing as learners interact with content in ways that align with their learning styles. Therefore, DLO are not merely substitutes for traditional resources; instead, they serve as transformative tools that enrich learning experiences through the effective integration of technology (Talens, 2025).

In parallel, the Nominal Group Technique (NGT) has gained recognition as a robust method for generating ideas and achieving consensus in research and evaluation settings. It is beneficial in contexts where diverse perspectives are valued, as it ensures equal participation from all individuals involved (Malkan & Mustapha, 2023). Through a structured process involving idea generation, clarification, and voting, NGT captures both the breadth of viewpoints and the depth of reasoning, facilitating the collection of rich data (Tahir & Abdullah, 2023). It is widely regarded as a hybrid methodology, blending quantitative measures (e.g., scoring and ranking) with qualitative insights (e.g., participant rationales and contextual interpretations), thereby strengthening the validity and applicability of the findings (Khurshid et al., 2023).

3.0 Methodology

This study employed the NGT as its primary methodological approach to collect, prioritise, and synthesise expert opinions systematically. The NGT is a structured, multistep method commonly used to generate and rank ideas in a group setting through individual input and collective evaluation. It is particularly suitable for educational research involving practitioner-based knowledge.

There has been ongoing debate regarding the appropriate sample size for studies employing the NGT. For this study, the researchers selected a total of 13 COS teachers as respondents, following Carney et al.'s (1996) recommendation of a minimum of six participants for effective NGT implementation. A total of 13 primary school teachers involved in the COS programme in the Malaysian states of Pahang, Kelantan, and Terengganu
provided the data for this study.

The researchers conducted the NGT session online via Google Meet due to logistical limitations and the geographical dispersion of participants. The session, adapted from the model proposed by Vahedian-Shahroodi et al. (2023), was held synchronously and lasted approximately two hours, divided into two main phases. In the first phase, the researchers gave participants a structured briefing on the concept, rationale, and current literature surrounding DLO. In the second phase, participants engaged in the NGT process to identify the most effective DLO components for use in teaching and learning based on their professional experience and pedagogical needs.

To facilitate real-time participation and documentation, each participant was assigned a unique Google Docs link containing worded stimulus questions. The NGT session followed four core steps:

i. Idea Generation (Silent Brainstorming) – 15 minutes:
The researchers instructed participants to independently record their responses to a stimulus question in the shared document. This silent brainstorming phase encouraged equal opportunity for contribution without group influence or Discussion.

ii. Round-Robin Sharing – 30 minutes:
Each participant shared one idea at a time in a turn-taking manner. The facilitator compiled and displayed all ideas on a shared virtual Canva whiteboard visible to all participants. To maintain objectivity and avoid premature judgment, no discussion or evaluation of ideas was allowed during this stage.

iii. Clarification and Discussion – 30 minutes:
In this phase, the facilitator guided a discussion where participants could seek clarification, ask questions, or elaborate on the meaning of each idea. To ensure mutual understanding and eliminate ambiguity, the researchers clarified all instructions and expectations with the participants before proceeding. Importantly, this step did not involve critique but instead focused on ensuring that each idea was clearly defined and comprehensible to all.

iv. Individual Voting and Prioritisation – 10 minutes:
Participants independently evaluated and ranked the proposed ideas using a three-point Likert scale, where 1 indicated "Not Suitable," 2 indicated "Neutral," and 3 indicated "Suitable." The researchers then calculated the cumulative score for each idea to determine the priority ranking of the proposed DLO components.

Data were subsequently analysed using NGT-Plus software, which facilitated quantitative tabulation of participant responses and rankings. This analysis provided insight into the collective preferences and priorities of COS teachers regarding the suitability of various DLO components for integration into their classroom practice.

4.0 Findings

Table 1 presents the evaluation outcomes of participants regarding five key components of DLO, namely instructional videos, audio-based learning, online assessments, learning platforms, and mobile applications. The researchers assessed these components using the NGT approach, with each participant providing individual scores. The data include total scores, percentage of agreement, ranking order, and the level of consensus regarding the suitability of each component within the context of DLO development for educational purposes. This structured evaluation provides insights into the perceived effectiveness and relevance of each component in enhancing teaching and learning practices, particularly for COS teachers operating in digitally evolving environments.

Table 1: Analysis of NGT Results

Items	Voter													Score	% Agreement	Rank	Consensus
	1	2	3	4	5	6	7	8	9	10	11	12	13				
Instructional Video	3	2	3	3	2	3	3	2	3	2	2	2	3	33	84.62	4	Suitable
Audio-based learning	3	3	3	2	2	3	2	2	3	3	3	3	2	34	87.18	3	Suitable
Online assessments	3	3	3	3	3	3	3	3	3	2	3	3	3	38	97.44	1	Suitable
Learning platforms	2	3	3	3	3	3	3	3	3	3	3	3	3	38	97.44	1	Suitable
Mobile applications	3	3	2	2	3	3	3	2	3	3	3	3	3	36	92.31	2	Suitable

** The applicability rating of the NGT technique must be above 70 per cent*

The findings of this study indicate that all evaluated elements recorded agreement percentages exceeding 70%, affirming their overall suitability for integration into digital teaching and learning environments (Malkan & Mustapha, 2023). Based on Table 1, the findings indicate that online assessments and learning platforms received the highest level of agreement among participants, at 97.44%, and were ranked first in terms of suitability. Mobile applications followed with 92.31%, earning the second place. Audio-based learning achieved an 87.18% success rate and was ranked third, while instructional videos received an 84.62% success rate, placing them in fourth place.

The participants considered all five components suitable for use in digital teaching and learning, as indicated by the results. This analysis substantiates that all five components of the DLO assessed are not only appropriate but also contribute effectively to enhancing educational delivery in digital contexts. The ranking differences reflect the perceived functional priorities and immediate needs of educators; each component plays a complementary role within a holistic digital learning ecosystem. The implementation of DLO, which integrates assessment mechanisms, LMS-based platforms, mobile accessibility, and audio-visual delivery, demonstrates significant potential to improve student engagement, foster self-directed learning, and enhance academic achievement.

5.0 Discussion

5.1 Online Assessment and Learning Platforms (Agreement: 97.44%)

These two components received the highest ratings from expert participants, indicating their perceived suitability as core elements in implementing DLO. Their prioritisation reflects the critical need for structured assessment systems and systematic content delivery platforms within digital education ecosystems. According to Spector et al. (2018), digital assessments play a pivotal role in fostering student accountability in self-directed learning, enabling educators to evaluate academic progress with greater accuracy and flexibility. Similarly, learning platforms contribute to the coherence and consistency of content delivery while allowing students on-demand access to instructional materials. This finding aligns with the results of Hu et al. (2023), who emphasise that LMS significantly enhances student achievement and motivation due to its integrated features, including collaboration tools, interactivity, and monitoring capabilities.

5.2 Mobile Applications (Agreement: 92.31%)

Mobile applications were also rated as highly suitable, ranking second among the components. The use of mobile apps reflects the pedagogical shift towards mobile learning, which emphasises accessibility and contextual engagement through handheld devices. Alieto et al. (2024) and Andrin et al. (2024) highlight the benefits of mobile applications in supporting flexible, personalised learning environments suited to the dynamic lifestyles of today's learners. Furthermore, researchers have shown that mobile apps facilitate access to micro-content, enhancing information retention and content reinforcement through repeated exposure.

5.3 Audio-based Learning and Instructional Video (Agreement: 87.18% and 84.62)

Despite ranking third and fourth, both components achieved agreement levels exceeding 70%, suggesting substantial relevance and effectiveness in DLO integration. Audio-based learning supports students with auditory learning preferences, while video content enhances both visual and affective engagement. Mayer (2024), drawing on the cognitive theory of multimedia learning, argues that the concurrent use of audio and visual modalities facilitates more effective information processing and long-term memory retention. These findings affirm the pedagogical value of integrating multimedia elements to cater to diverse learning styles and preferences.

6.0 Conclusion & Recommendations

The findings of this study demonstrate that all components of DLO were deemed suitable by participants, with online assessment and learning platforms identified as the most critical elements for effective digital delivery. The researchers highlighted the necessity of a comprehensive, interactive, accessible, and student-centred approach to digital learning based on the findings. However, as this study was conducted solely in the East Coast states of Peninsular Malaysia, namely Pahang, Kelantan, and Terengganu, the findings may not fully represent the educational context in other Malaysian states that differ in terms of socioeconomic background and the level of educational infrastructure. Furthermore, the small sample size, which involved only primary school COS teachers, may not adequately reflect the demographic diversity of the entire COS teacher population in Malaysia. Overall, the study supports the view that DLO transcends mere teaching aids and instead represents an integrated system of technology and pedagogy that fosters more effective, flexible, and inclusive learning experiences.

Further research on the utilisation of DLO by COS teachers is essential to ensure that educational technology adoption not only occurs but genuinely enhances teaching effectiveness, especially among educators facing constraints related to time, training, and resources. Future researchers should extend this study on DLO to other Malaysian states beyond Pahang, Kelantan, and Terengganu to assess its effectiveness across a broader and more varied educational context. Recommended future studies include quantitative comparative research to evaluate differences in DLO effectiveness between COS and permanent teachers. Additionally, quasi-experimental designs could be employed to assess the extent to which DLO integration improves the instructional effectiveness of COS teachers in classroom settings. Furthermore, this evidence-based prioritisation provides strategic guidance for stakeholders, including policymakers, curriculum developers, and teacher trainers, to focus on the most impactful digital interventions. Emphasising the development and deployment of online assessments and robust learning platforms while also supporting mobile integration and multimedia content development can help bridge the digital pedagogical gaps experienced by novice and underserved educators.

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Paper Contribution to Related Field of Study

This study provides a meaningful contribution to the field of educational technology by showcasing how DLO can be effectively utilised to enhance instructional delivery, particularly among novice COS teachers. Through the use of the NGT, the research captures authentic teacher perspectives, identifying critical DLO components that support flexible, accessible, and engaging learning experiences. The study not only addresses the immediate instructional needs of under-supported educators but also lays a strong foundation for future research and policy development aimed at advancing digital pedagogy in underserved educational contexts. Ultimately, the findings highlight the transformative potential of DLO in enhancing instructional effectiveness, promoting professional growth, and ensuring equitable access to high-quality digital education.

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