Trainees' Perception and Engagement with Graphic Organizers and the Influence on Outcomes of Trainees with Diverse Learning Needs

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ABSTRACT

Education is a fundamental right for all children, including those with diverse learning needs, and plays a critical role in achieving the Sustainable Development Goals. The integration of Information and Communication Technology in education has brought particular benefits to learners with diverse needs, including visual presentations, self-paced learning, engaging graphics, and greater autonomy in the learning process. Despite these advancements, there is limited research on the development of inclusive Graphic Organizers ensuring that all learners feel supported and valued. This study aimed to address this gap by examining trainees' perception and engagement with Graphic Organizers and its influence on learning outcomes of learners with diverse needs. The study adopted a mixed-methods approach within an experimental research design. The target population comprised 52 participants: the Centre Manager, seven instructors, and 44 trainees with diverse learning needs, all selected purposively from the Kenyatta Industrial Vocational Rehabilitation Centre in Nairobi County. A census approach was used, with all 44 trainees participating in the study. These trainees were evenly divided into two groups: 22 in the experimental group and 22 in the control group. The experimental group received instruction using Advance Organizer treatments over a two-week period, while the control group received conventional instruction from their regular instructor during the same timeframe. After the instructional period, a post-test was administered to both groups to assess learning outcomes. Additionally, structured questionnaires were distributed to the trainees with clear guidance on how to complete them. A key informant interview was also conducted with the Centre Manager to gather in-depth qualitative insights. The findings indicate that Graphic Organizers significantly motivate trainees to study more. Additionally, the study revealed a notable improvement in trainees' performance scores after the integration of Graphic Organizers into their learning activities. Based on the findings, the study recommends that institutions should integrate Graphic Organizers into the instructional design for learners with diverse learning needs, given their proven ability to improve motivation, engagement, and performance. Additionally, learner-centered strategies should be promoted, where trainees actively use GOs to brainstorm, categorize, and synthesize information during lessons.

Keywords: Graphic Organizers, Trainees, Learning Needs, Learning Outcomes, Perception.

INTRODUCTION

Teachers have long utilized graphic organizers as a tool to help students collect, sort, structure, and communicate information. These tools are popular due to their versatility and ability to be applied across a range of topics and subject areas. While general education teachers are typically familiar with standard graphic organizer formats, they may not always know how to modify them for learners with diverse educational needs (Yavuz, Karaaslan, & Yikmis, 2021). Though both general and special education teachers frequently use graphic organizers, it is important to evaluate how different features might create challenges for students in inclusive settings. For instance, a student with cerebral palsy and cognitive impairments who uses an arm brace may require specific modifications to participate in a graphic organizer activity. Simply observing a peer fill in the organizer is not an adequate accommodation. Instead, the materials should be adapted, such as using movable word cards or physical objects, so that the student can engage with the activity more independently. This adapted version could still involve collaboration with a peer, but both students would interact with the modified materials together (Mims, Hudson, & Browder, 2012).

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When designing accessible graphic organizers (GOs) for inclusive classrooms, teachers must take into account a range of factors. Students differ in their learning levels, preferred learning styles, cultural and language backgrounds, and prior knowledge, all of which influence how they absorb and process information (Meyer, Rose, & Gordon, 2014). Educators need to tailor the use of GOs according to these diverse learner characteristics, ensuring that lesson plans provide multiple ways for students to engage with content, understand it, and demonstrate their learning. Incorporating the GO framework means that no student, including those with significant cognitive disabilities, should be reduced to their challenges or the supports they require in order to learn (Hartmann, 2015). Instead, teachers working in inclusive environments can use the GO approach as a tool to respond to student diversity. By applying principles of universal design, they can create learning experiences that welcome and support all students, including those with diverse learning needs (Hartmann, 2015).

Advance organizers have been shown to significantly enhance knowledge acquisition, particularly in second language learning (Reyes, Wakeman, & Bowman, 2020). Research findings based on pre- and post-test results indicate that graphic advance organizers greatly support English language development by helping learners structure information and ideas, thereby supporting cognitive processes involved in understanding and organizing new concepts. Tamir (1992), in a classical study, highlighted that advance organizers also serve as effective tools for language practice. Similarly, Racheal M. (2013) found that the use of advance organizers positively influenced students' academic performance, attitudes, and perceptions in learning narrative literature in English among secondary school learners in Kilifi District, Kenya. Additionally, Keraro and Shihusa (2009) reported that students exposed to instruction using advanced graphic organizers achieved significantly higher scores in Chemistry post-tests, demonstrating improved learning outcomes.

Studies conducted on various subjects in Kenya indicate that advanced organizers positively impact students' learning outcomes. However, there is limited research specifically examining the influence of graphic organizers on the learning outcomes of trainees with diverse learning needs. According to a study by Alghamdi, Jitendra, and Lein (2020), trainees with diverse learning needs often experience learning disabilities such as dyslexia (reading difficulties), dysgraphia (writing challenges), and dyscalculia (math-related difficulties), which can hinder their ability to learn or access education compared to their peers. These learners may require additional or specialized support beyond what is typically provided to students of the same age. Conventional teaching methods may fall short in addressing their varied needs and learning preferences.

A recent evidence-based practice review by Saunders et al. (2020) identified graphic organizers (GOs) as a promising instructional strategy for students with significant cognitive disabilities in inclusive classroom settings. In the review, GOs were utilized to support reading comprehension in content areas such as science and social studies. While the findings indicated positive outcomes for students when GOs were used during instruction, the authors emphasized the need for further research to establish GOs as a fully evidence-based practice. For educators, the key takeaway is that GOs can support students with diverse learning needs in demonstrating higher-order thinking skills aligned with the rigor of grade-level academic standards. Based on this, the present study aimed to explore learners' perceptions and engagement with GOs and examine how these factors influence their academic outcomes.

The remainder of the paper is organized as follows: Section 2 outlines the methodology employed in the study, while Section 3 presents the results and discussion. Section 4 provides the conclusion and policy recommendations.

METHODOLOGY

This study adopted a mixed methods approach, integrating both quantitative and qualitative data within an experimental design. This design was well-suited for examining the role of graphic organizers (GOs) on the learning outcomes of students with diverse learning needs. The research was carried out at the Kenyatta Industrial Vocational Rehabilitation Centre (KIVRC) located in Nairobi County, Kenya's capital city, situated in the south-central region of the country, approximately 483 kilometers northwest of Mombasa. Nairobi's geographic coordinates are latitude 1.286389°S and longitude 36.817223°E, corresponding to GPS coordinates 1°17′11.0004″S and 36°49′2.0028″E.

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The study population comprised learners with diverse learning needs at the KIVRC, including all 44 enrolled trainees, one Centre manager, and seven instructors. All 44 learners participated in the study and were equally divided into two groups: 22 in the experimental group and 22 in the control group. To assess baseline competence, a pre-test was administered to both groups before the instructional intervention. The experimental group received instruction using Advanced Organizer Treatments over a period of two weeks, comprising 10 lessons (five lessons per week). In contrast, the control group received instruction from their regular instructor using conventional teaching methods for the same duration.

Following the two-week instructional period, a post-test was administered to both groups to evaluate changes in learning outcomes. Additionally, questionnaires were administered to the learners with clear instructions on how to respond. A structured questionnaire focused on the perception and engagement of learners and instructors in GOs. To complement these data, a key informant interview was conducted with the Centre manager.

RESULTS

The study involved 44 trainees with diverse learning needs, one center manager, and seven instructors. A complete response rate of 100% was attained, largely due to the participants' accessibility and cooperation. Demographic analysis indicated that female trainees constituted a higher proportion (56.62%) compared to their male counterparts (43.18%) at the Kenyatta Industrial Vocational Rehabilitation Centre. In terms of age, most trainees were over 18 years (72.73%), followed by those aged 16 to 17 years (20.45%), and a smaller group aged 14 to 15 years (6.8%).

With regard to the instructors, the majority were female (57.14%), while males represented 42.86%. Most instructors were above the age of 35. In terms of academic credentials, all seven instructors possessed Diploma-level qualifications, suggesting they were suitably trained to work with learners who have diverse educational needs. When asked about their exposure to graphic organizers (GOs), 57.1% reported gaining this experience during their college teacher training programs, while 42.9% acquired it through in-service professional development.

Trainees' Perception and Engagement with Graphic Organizers

Trainees with diverse learning needs were asked to indicate the level at which they agreed to the constructs associated with their perception and engagement on GO using a scale of 1-5 where; 1=Strongly Disagree (SD), 2=Disagree (D), 3=Not Sure (NS), 4=Agree (A), and 5=Strongly Agree (SA). Summary statistics are presented in Table 1 below.

Table 1: Summary statistics on Trainees' Perception and Engagement with GO

Construct	SD (%)	D (%)	NS (%)	A (%)	SA (%)	Mean	Std. Deviation
GO motivates me to study more	0.0	0.0	0.0	36.4	63.6	4.6	0.4
GO have a significant impact to my learning process	2.3	0.0	6.8	29.5	61.4	4.4	0.8
GO improves my active participation	0.0	2.3	4.5	36.4	56.8	4.4	0.6
Go stimulates my learning interest	0.0	0.0	4.5	34.1	61.4	4.5	0.5
Go acts as an effective learning tool	0.0	0.0	2.3	31.8	65.9	4.6	0.5

Mean: SD=1.00-1.80, D=1.81-2.60, NS=2.61-3.40, A=3.41.4-20, SA=4.21-5.00

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Summary statistics indicate that a majority (63.6%) of trainees with diverse learning needs strongly agreed with the statement that Graphic Organizers motivate them to study more. This suggests that GOs possess a motivational component for learners with diverse needs. Similarly, 61.4% of the respondents strongly agreed that GOs have a significant impact on the learning process, indicating widespread recognition of their effectiveness. In addition, there was strong support for the view that GOs enhance active participation. Specifically, 56.8% of trainees strongly agreed, while 36.4% agreed with this assertion. The study also found that 61.4% of respondents strongly agreed that GOs stimulate their interest in learning, likely due to the practical and visual nature of these tools. Furthermore, GOs were overwhelmingly endorsed as effective learning aids. A total of 65.5% of trainees strongly agreed that GOs serve as an effective tool in supporting learning outcomes.

Insights from a qualitative interview with the center manager further reinforce these findings. When asked about the relationship between trainees' perceptions of GOs and their academic performance, the manager explained:

> *".....the practical nature of GO makes it a powerful tool which motivates learners with diverse learning needs to get involved with the result being, better learning outcomes."*

These findings are supported by existing literature. For instance, Zollman (2009) observed that Graphic Organizers motivated fourth-grade students to structure their ideas, which in turn enhanced both their reading comprehension and communication skills. He further noted that GOs enable learners to brainstorm without the pressure of organizing ideas in a specific sequence. Similarly, Tandog and Bucayong (2019) found that GOs serve as visual learning tools that help students categorize and articulate their thoughts more effectively. In the context of science education, Torres et al. (2014) reported that GOs improved student learning in chemistry by aiding in the understanding and retention of complex concepts. Likewise, Ponce et al. (2018) emphasized that GOs enhance the learning process by visually supporting the organization and expression of ideas.

Trainees' Preferences on the Role of Different Types of Graphic Organizers

Trainees were also asked to indicate their preferred types of Graphic Organizers (GOs) by rating their level of agreement with five statements regarding the role of different types of GOs. A five-point Likert scale was used, where 1 = Strongly Disagree (SD), 2 = Disagree (D), 3 = Not Sure (NS), 4 = Agree (A), and 5 = Strongly Agree (SA). The summary statistics for their responses are presented in Table 2.

Table 2: Summary statistics on Trainees Preference on role of different types of GO

Construct	SD (%)	D (%)	NS (%)	A (%)	SA (%)	Mean	Std. Deviation
I prefer cognitive mapping GO.	2.3	0.0	9.1	45.5	43.2	4.2	0.8
I prefer semantic mapping GO.	2.3	0.0	20.5	40.9	36.4	4.0	0.8
I prefer semantic feature analysis mapping GO.	0.0	4.5	20.5	40.9	34.1	4.0	0.8
I prefer syntactic mapping GO.	0.0	2.3	11.4	43.2	43.2	4.2	0.7
I prefer visual display mapping GO.	0.0	0.0	20.3	20.5	77.3	4.7	0.4

Mean: SD=1.00-1.80, D=1.81-2.60, NS=2.61-3.40, A=3.41.4-20, SA=4.21-5.00

Source: The Researcher, 2025

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Summary statistics indicate that 45.5% of trainees expressed a preference for cognitive mapping Graphic Organizers over other types. The mean response for this type was 4.2, with a standard deviation of 0.8. A similar trend was observed for semantic mapping GOs, preferred by 40.9% of the trainees, also with a mean score of 4.0 and a standard deviation of 0.8. Likewise, 40.9% of trainees favored semantic feature analysis mapping GOs. Preference for syntactic mapping GOs was also notable, with 43.2% of respondents agreeing it was the most effective, yielding a mean of 4.2 and a standard deviation of 0.7. Visual display mapping GOs emerged as the most preferred overall, with 71.4% of trainees favoring this type and a mean score of 4.4. While the majority supported the usefulness of various GOs, a small number of trainees expressed disagreement. Specifically, 4.5% disagreed with the preference for semantic feature analysis mapping GOs, and 2.3% disagreed with the preference for syntactic mapping GOs. These results suggest that while preferences vary, trainees value different types of GOs for their unique strengths.

A qualitative interview with the center manager supported these findings. The manager explained that using a variety of GO types enhances the learning experience, as each type serves a specific purpose. When asked if learners preferred any particular type of GO, the manager responded:

> "……. There are various approaches to Go, and each approach has its own merit."

Overall, trainees demonstrated varied preferences for different types of GO, with visual display mapping emerging as the most favored. Empirical evidence supports the notion that each type of GO serves a distinct purpose, and no single type is universally sufficient for all learning contexts. Foundational works by Ausubel (1968) and Mayer (1979) classified GOs into several categories, including cognitive mapping, semantic mapping, semantic feature analysis, syntactic mapping, advanced organizers, and visual displays. Cognitive mapping, for example, is useful for making central ideas and their interconnections explicit, typically using lines, arrows, and spatial arrangements to illustrate the structure and key conceptual relationships within a text. On the other hand, advanced organizers, according to Ausubel (1969), are instructional tools designed to bridge the gap between learners' prior knowledge and new information. He described them as relevant and inclusive introductory materials that prepare learners for what they are about to learn.

In the study, the learning outcomes of trainees with diverse learning needs were evaluated by comparing pre- and post-test scores between the experimental and control groups. Table 1 presents the frequency distribution of these outcomes, reflecting the effects of the GO intervention.

Table 1: Frequency distribution of learning outcomes before and after the intervention

Pre-test			**Post-test**	
% score	**Frequency**		**Frequency**	
	Experimental	**Control**	**Experimental**	**Control**
10-20	0	0	0	2
21-30	2	1	0	0
31-40	1	2	0	0
41-50	3	2	0	1
51-60	0	3	0	1
61-70	9	6	2	7
71-80	7	6	2	3
81-90	0	0	6	2
91-100	0	2	12	6
Total	**22**	**22**	**22**	**22**

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The frequency statistics indicate that prior to the intervention (treatment), the learning outcomes of the experimental and control groups were nearly identical. For example, no trainee in either group scored between 10–20% or 81–90% of the total 100 marks in the pre-test. Across the remaining score ranges, only minor variations were observed between the two groups, suggesting that at baseline, their academic performance levels were comparable. This confirms that the study met the key prerequisite for experimental research, that groups are equivalent at the outset.

Following the intervention, the post-test results revealed a notable divergence in performance between the two groups, indicating the impact of the GO intervention. Notably, no trainee in the experimental group scored below 61%, whereas four trainees in the control group, representing 18.18% fell below this threshold. Furthermore, more than half of the trainees (12) in the experimental group achieved scores between 91–100%, compared to only six in the control group. In summary, the experimental group outperformed the control group in the post-test, suggesting a positive effect of the GO on learning outcomes.

These findings are supported by existing literature. For instance, Miranda (2011) found that GOs aid students in visualizing, organizing, and effectively comprehending information. Similarly, Sakiyo and Waziri (2015) argued that GOs help simplify complex concepts, reveal relationships between ideas, and enhance memory retention factors that are critical to improved academic performance. The next section, presented in Table 2, outlines the learning outcomes for both the experimental and control groups, including the percentage change in scores.

Table 2: Learning Outcome of Trainees before and after the intervention

Experimental Group				**Control Group**		
Trainees	**Post test score (%)**	**Pre-test score (%)**	**% Change**	**Post test score (%)**	**Pre-test score (%)**	**% Change**
1	92	30	62	56	48	8
2	92	42	50	100	92	8
3	92	74	18	84	74	10
4	92	72	20	64	72	-8
5	92	74	18	100	100	0
6	88	74	14	12	28	-16
7	68	48	20	20	40	-20
8	88	68	20	62	56	6
9	88	74	14	70	76	-6
10	64	40	24	68	66	2
11	86	74	12	80	70	10
12	80	68	12	44	36	8
13	74	28	46	72	74	-2
14	92	70	22	64	60	4
15	86	48	38	72	66	6
16	96	62	34	68	62	6
17	96	74	22	84	70	14
18	92	70	22	96	48	48

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19	88	70	18	96	66	30
20	96	66	30	96	74	22
21	92	66	26	92	76	16
22	96	62	34	68	52	16
Summation	**1930**	**1354**	**576**	**1568**	**1406**	**162**
Mean	**87.72**	**61.54**	**26.18**	**71.27**	**63.91**	**7.36**
STD. Deviation	**8.8**	**14.98**	**13.08**	**23.56**	**17.19**	**14.61**

The computed test scores for the experimental group indicate a substantial improvement in trainees' performance following the intervention. The mean score increased from 61.54% in the pre-test to 87.72% in the post-test. This improvement was consistent across all trainees in the group, demonstrating a uniformly positive effect of the intervention. In contrast, the control group showed only a modest increase in performance, with a mean difference of just 7.36%, compared to 26.18% in the experimental group. These results suggest that trainees who used Graphic Organizers were nearly four times more likely to achieve significant gains in learning outcomes than those in the control group. Additionally, the relatively low standard deviation in the post-test scores of the experimental group suggests that Graphic Organizers not only enhance performance but also contribute to more consistent and standardized learning outcomes among trainees with diverse learning needs.

CONCLUSION

The study assessed how trainees with diverse learning needs perceive and engage with Graphic Organizers as a learning tool and the influence on learning outcomes. The findings indicate that GOs significantly motivate trainees to study more, an outcome supported by Zollman (2009). Additionally, GOs were found to enable learners to brainstorm and organize ideas freely without the pressure of arranging them in a particular order. This aligns with Tandog and Bucayong (2019), who describe GOs as visual tools that support the categorization and expression of students' thoughts. There was also strong consensus among the trainees that GOs positively influence the learning process. These results are consistent with Torres et al. (2014), who argue that GOs enhance students' comprehension and retention of concepts. Furthermore, the study revealed a notable improvement in trainees' performance scores after the integration of GOs into their learning activities. Based on these conclusions, we recommend for Institutions to embed GOs into the instructional design for learners with diverse needs, given their proven ability to improve motivation, engagement, and performance. Additionally,
educators should be trained on how to effectively design and implement GOs to cater to various learning styles and cognitive needs. Furthermore, learner-centered strategies should be promoted, where trainees actively use GOs to brainstorm, categorize, and synthesize information during lessons.

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