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The Effectiveness of Human Graphing Activities as a Kinaesthetic Learning Tool among Secondary Students in Terengganu

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ABSTRACT

Human Graphing is an activity in which learners physically position themselves according to data or responses, designed and facilitated by teachers. It has the potential to enhance engagement, interaction, and comprehension, yet its effectiveness in secondary schools is under-researched. This study examined teachers' and students' perceptions of Human Graphing and its impact on engagement, understanding, and memory. A quantitative design was employed, using structured online questionnaires administered to 40 teachers and 100 secondary school students in Terengganu. Descriptive statistics summarised demographic and perception data, Cronbach's Alpha assessed reliability, independent samples t-tests compared perceptions between groups, and Pearson correlation analysis explored the relationship between students' perceptions and learning outcomes. Findings indicated that teachers held highly positive views of Human Graphing's effectiveness (overall M = 4.11; α = 0.918), particularly in clarifying abstract concepts and increasing student interest. Students similarly reported favourable perceptions (overall M = 3.93; α = 0.779), noting improvements in enjoyment, understanding, and peer interaction. The t-test showed no significant difference between teachers' and students' perceptions, $t(138) = 1.35$, $p = 0.181$, suggesting both groups valued the strategy equally. A strong positive correlation was observed between students' perceptions and their understanding and memory ($r = 0.796$, $p < 0.001$), indicating that more positive attitudes toward Human Graphing were associated with better comprehension and retention. Overall, the study provides evidence that Human Graphing is an effective kinaesthetic learning tool that promotes engagement, deepens understanding, and strengthens memory, supporting its potential for wider implementation in secondary school teaching and learning.

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1. Introduction

Each individual differs in their preferred learning styles. In the process of acquiring knowledge, students tend to rely on their sensory abilities. Early theorists such as Fernald, Keller, Orton, Gillingham, Stillman, and Montessori introduced the Visual, Auditory, and Kinaesthetic (VAK) learning modalities in the 1920s [1]. Students who prefer kinaesthetic learning are inclined towards active learning approaches, such as embodied activities, Human Graphing, and human continuum activities. This learning style is commonly associated with active participation, collaborative group work, and educational visits [1]. Furthermore, this approach aligns with Gardner's (2011) the theory of multiple intelligences, with particular emphasis on bodily kinaesthetic intelligence [2].

Learning styles indicate how individuals interact with their environment and modify their learning strategies accordingly [3]. To avoid any disengagement and boredom during teaching and learning session; adaptation between learning styles is crucial [3]. Teachers should apply learning strategies such as differentiated teaching in order to meet the diverse needs of the students. And as suggested by Ministry of Education teacher should execute 21st Century Learning during class e.g. Human Graphing, Gallery Walk, I see I think I wonder and others.

Fig. 1. Students stand in line

This study specifically focused on Human Graphing activity. Human Graphing is an active learning that is associated with Kinaesthetic style of learning. Human Graphing is a human histogram exercise where students position themselves in a series based on their response [4], as illustrated in Figure 1. It can also be known as human continuum or human barometer. According to Britannia Education [5] this activity operates as a strategy to facilitate student opinions regarding a topic as well as serves as a strategy for teachers to assess students' level of understanding. This pedagogical method blends Visual, Auditory, and Kinaesthetic learning, engaging students in attentive listening [4], deliberate physical movement, and visual decision-making regarding where they position themselves and fostering them with meaningful discussion [4].

There are multiple ways to conduct a human graphing activity, and the process is not fixed to any single method. According to University, Kennesaw State [4] one of the ways is; Teachers should first select a topic, then create a poll, collect responses, share the results, and discuss the findings. Optionally, they can use interactive tools, followed by a related follow-up activity. There are several advantages and disadvantages associated with the use of human graphing activities. Among the benefits, students are able to practise making decisions and carrying them out effectively. As been stated in Britannica Education [5], this activity enhances students' ability to develop problem-solving

skills. Subsequently, through Human Graphing, students pay attention to differing perspectives and determine whether the points presented by others influence changes in their own thought processes [5].

Nonetheless, human graphing also presents certain drawbacks. Differences in opinions may arise, requiring teachers to exercise strong classroom management skills. As reported by Yusof *et al*., [6] Teachers should master classroom teaching and learning skills, including technical competencies and the use of instructional strategies. In accordance with Ali *et al.,* in 2023; teachers should have pedagogical skills in order to execute 21st century learning [7]. The skills that have been mentioned include mastery of effective classroom techniques. Some students may be too shy to express their views, while others may become easily distracted.

Initial observations indicate that research on Human Graphing and its effectiveness remains limited, even though this strategy is one of the approaches recommended in teaching. Fewer studies have been published on this technique. In fact, human graphing is referred to by several different names, even though the approaches are quite similar. For instance, a study by Jusslin *et al*., [7] focuses on integration of physical activities with linguistic learning. Macedonia (2019) and Macrine and Fugate (2021), as cited in Jusslin *et al*., [7] reported that the integration of exercise-based activities into classroom lessons evolved slowly especially in linguistic areas. Additionally, research in the linguistic field indicates that embodiment activities contribute to stronger academic performance and more meaningful learning [7]. However, this research [7] has not specifically addressed Human Graphing. Hence, this study aims to investigates students' perceptions of its effectiveness in improving their understanding and engagement.

A recent study in 2025 reports that kinaesthetic learning can enhance and support cognitive skills, as well as promote memory retention [8]. According to Simamora *et al*., [8], some students expressed when learning was incorporated with hands-on activities and movement, they felt highly motivated. In spite of that, kinaesthetic approaches are not universally effective; some students do not respond well to physical activities and may require more abstract forms of thinking, making kinaesthetic methods less suitable for them. Also, lacking props and tools may restrict hands-on learning [8]. Research by Simamora *et al*., [8] did not explicitly define human graphing, especially since human graphing is much easier to manage and does not require many or expensive tools. Therefore, this study aims to evaluate teachers' perceptions of implementing Human Graphing as a kinaesthetic learning tool in secondary schools.

As been stated by Castro Alonso *et al*., [9], learning can be strengthened when brain, body and environment work together. This is in line with Abrahamson *et al*., 2020, as cited in Kozanitis, [10] that, problem solving skills can be hone and learning could be enhanced through a holistic approach that integrates cognitive, physical, and environment [10]. Kozanitis *et al*., [10] that when students take on roles in learning, it can replicate real-world environments. Similarly, in Human Graphing, students position themselves to mirror real-life situations, while discussions occur throughout the activities. Research in this specific area is still relatively limited, which highlights the need for further investigation to compare teachers and students' perceptions regarding the effectiveness of Human Graphing in the teaching and learning process.

Physical representation has been shown to make abstract ideas more concrete [11], whereas bodily engagement can enhance cognitive processing [12]. Movement-based tasks have also been found to improve motivation and focus [13]. In comparison, active learning approaches contribute to better attention and academic performance [14] as well as stronger knowledge retention [15]. Collectively, these findings suggest that kinaesthetic and active learning support both engagement and cognitive outcomes. In this context, the present study examines how students' perceptions of Human Graphing relate to their understanding in learning activities.

This study aims to investigate the effectiveness of Human Graphing activities as a Kinaesthetic learning tool among secondary students in Terengganu. The specific objectives for this article are: 1) to evaluate teachers' perceptions of the implementation of Human Graphing as a Kinaesthetic learning tool in secondary school; 2) to assess students' perceptions of the effectiveness of Human Graphing in deepening their understanding and engagement in learning; 3) to compare teachers and students' perceptions regarding the effectiveness of Human Graphing in the teaching and learning process; and 4) to analyse the relationship between students' perceptions of Human Graphing and their understanding in the learning activities.

2. Methodology

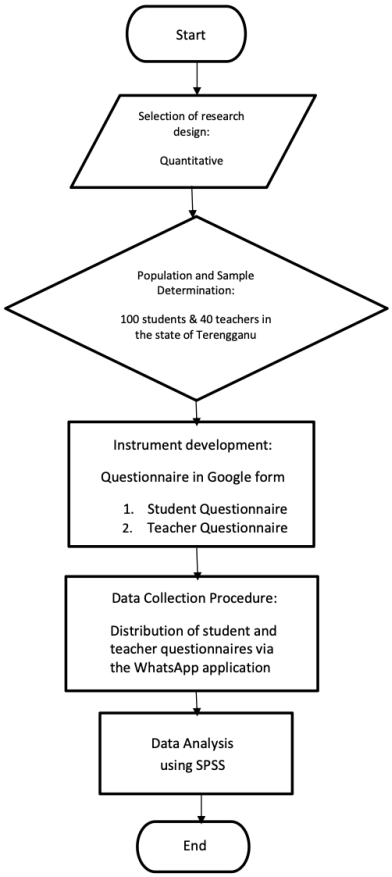

Fig. 2. Flowchart of the collecting and analysing data procedure

2.1 Research Design

The data collection and analysis procedure is summarized in Figure 2, which presents the flowchart of the research design. This study adopted a quantitative research design to evaluate the implementation and effectiveness of the Human Graphing activity from the perspectives of both teachers and students. The quantitative approach was selected as it enables systematic data collection and statistical analysis, allowing the variables under investigation to be measured accurately and objectively [16]. A survey method was employed through the use of structured questionnaires to obtain empirical data from the target respondents.

2.2 Population and Sample

The population of this study comprised secondary school students and teachers in the state of Terengganu. A total sample of 100 students and 40 teachers was selected to represent the target population. Convenience sampling was used due to accessibility and feasibility considerations, particularly because the respondents were readily available and actively involved in the teaching and learning processes where Human Graphing was implemented. Including both teachers and students allowed for a more comprehensive and comparative understanding of how the activity is practised and perceived within actual classroom contexts.

2.3 Research Instrument

Data for this study were collected using online questionnaires developed via Google Forms. The use of digital instruments allowed efficient distribution, reduced administrative costs, and streamlined the processes of data collection, organisation, and storage [17]. Two separate questionnaires were designed: one for students and another for teachers. Both instruments were developed based on relevant literature and aligned with the study objectives.

2.3.1 Student questionnaire

The questionnaire consisted of two main sections.

Section A collected demographic information such as gender, school, grade level, and prior experience with Human Graphing activities.

Section B comprised items measuring three main constructs:

i. Students' perceptions and attitudes.
ii. Understanding and retention.
iii. Engagement and readiness in learning through Human Graphing.

The questionnaire employed a five-point Likert scale, as follows:
1 = Strongly Disagree
2 = Disagree
3 = Somewhat Agree
4 = Agree
5 = Strongly Agree

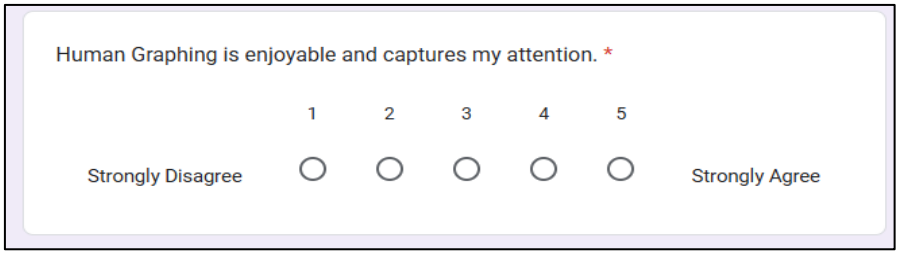

Fig. 3. Sample Likert-scale student questionnaire item

Figure 3 demonstrates a sample Likert-scale item from the student questionnaire used in this study. Each construct contained four items, resulting in a total of 12 items in the instrument. The instrument was carefully designed to ensure content validity and consistency in evaluating the effectiveness of Human Graphing implementation within the classroom context.

2.3.2 Teacher questionnaire

The questionnaire consisted of two main sections.

Section A gathered demographic information such as gender, age, academic qualifications, and teaching background.

Section B contains several constructs that assess different aspects related to Human Graphing. These constructs include:

i. Teachers' perceptions of the use of Human Graphing.
ii. The activity's effectiveness and students' engagement levels during implementation.
iii. The challenges encountered by teachers in implementing this method in the classroom.

The questionnaire employed a five-point Likert scale, as follows:
1 = Strongly Disagree
2 = Disagree
3 = Somewhat Agree
4 = Agree
5 = Strongly Agree

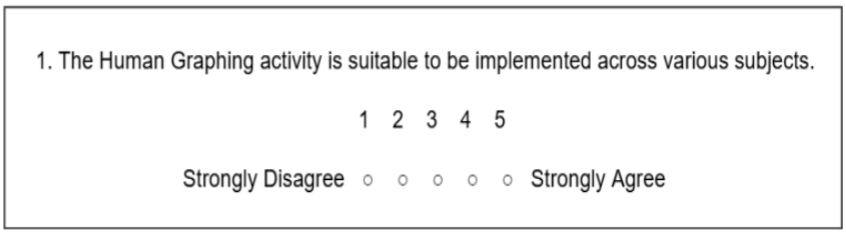

Fig. 4. Sample Likert-scale teacher questionnaire item

As shown in Figure 4, the teacher questionnaire employed a similar Likert-scale format to measure perceptions. All items were rated using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), allowing the analysis of teachers' evaluative judgments and experiences with the activity.

2.3.3 Validity and reliability of the instruments

Content validity was established through expert review. Two experts comprising experienced teachers and an academic lecturer in educational research evaluated the questionnaires for clarity, relevance, and alignment with the study objectives. Feedback from the experts was incorporated to improve item wording and ensure adequate coverage of the targeted constructs. A pilot study involving 100 students and 40 teachers was conducted to assess the reliability of the instruments.

Cronbach's Alpha was used to assess the internal consistency reliability of the research instruments. According to Tavakol and Dennick [18], Cronbach's Alpha values of 0.70 and above indicate acceptable reliability for instruments used in educational research. In this study, all constructs recorded Cronbach's Alpha coefficients exceeding 0.70, demonstrating satisfactory internal consistency and confirming the suitability of the instruments for the main study.

2.4 Data Collection Procedure

Data collection was conducted entirely online. The researcher distributed the Google Forms links to respondents via the WhatsApp application. Respondents were given one week to complete the questionnaires at their convenience. Responses were automatically recorded by the system and subsequently exported into Microsoft Excel for organisation before being imported into SPSS for further analysis. Participation was voluntary, and confidentiality was ensured throughout the process.

2.5 Data Analysis

Data were analysed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics such as frequency, percentage, mean scores, and standard deviation were used to summarise demographic characteristics and overall response patterns. Inferential statistical analyses, including independent samples t-tests and Pearson correlation analyses, were employed to examine differences and relationships across constructs relevant to the implementation and effectiveness of Human Graphing [19]. These analyses enabled the researcher to draw data-driven conclusions aligned with the study objectives.

3. Results

3.1 Demographic Profile of Respondents

The demographic characteristics of this study participants are presented in two categories: teachers (n = 40) and students (n = 100). Descriptive statistics, including frequency and percentage, were used to summarize their background characteristics, providing a comprehensive overview of the participants involved in the study.

The gender distribution of the teachers shows that 23 participants (57.5%) were female, while 17 participants (42.5%) were male. This indicates a slightly higher representation of female educators in this study. The presence of both male and female teachers ensures that the findings reflect perspectives from both genders, although the moderate imbalance may influence engagement and perceptions in teaching activities such as Human Graphing. Female teachers may have different interaction styles or preferences in facilitating learning, which could subtly affect outcomes. Nevertheless, the gender composition provides a reasonably balanced representation of the teaching population, and future studies may consider an equal gender ratio to explore potential differences in pedagogical approaches and engagement. The gender distribution of teacher participants is presented in Figure 5.

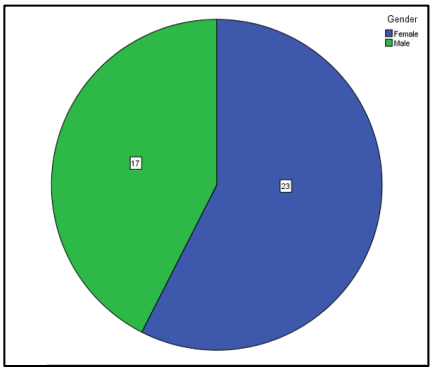

Fig. 5. Gender distribution of teacher participants (n = 40)
(Note: Female teachers represented a slightly higher proportion (57.5%) compared to male teachers (42.5%)

The age distribution of the teacher participants ranged from early-career educators in their twenties to senior teachers above fifty. This variation in age ensures that perspectives from different generational cohorts are captured, encompassing diverse teaching styles, experiences, and professional insights. Younger teachers may bring innovative or contemporary approaches to classroom activities, while senior teachers may contribute strategies informed by extensive experience. The inclusion of multiple age groups strengthens the validity of the study by providing a holistic view of the teaching population. As shown in Figure 6, teacher participants ranged from early-career to senior educators.

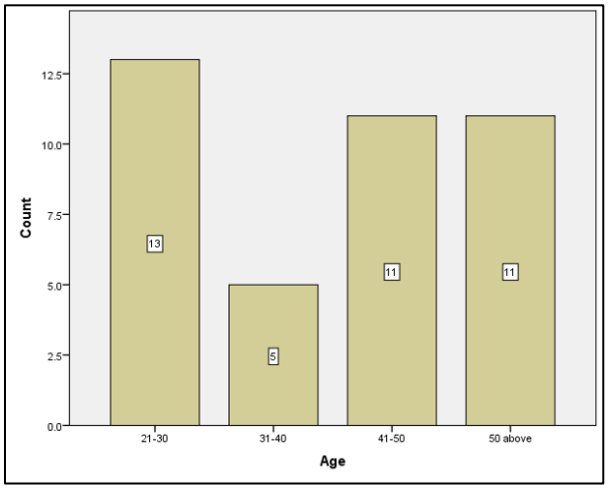

Fig. 6. Age distribution of teacher participants (n = 40)

The gender composition of student participants reveals that 70 students (70%) were female and 30 students (30%) were male. This higher female participation could reflect either the gender composition of the classes or a greater willingness among female students to engage in kinaesthetic learning activities such as Human Graphing. The predominance of female students may influence the interpretation of overall engagement levels and perceptions of the learning activity. Despite this imbalance, the inclusion of both genders allows for meaningful analysis, and future studies should consider balancing gender representation to improve generalizability of findings. Figure 7 depicts the gender composition of student participants.

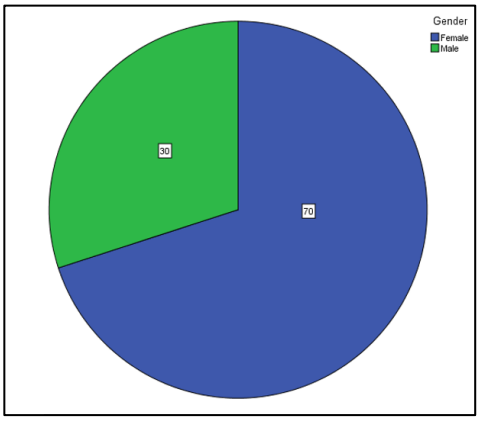

Fig. 7. Gender distribution of student participants (n = 100)
(Note: Female students accounted for 70% of the sample, whereas male students represented 30%)

The distribution of students across grade levels shows that participants were drawn from Forms 1 to 5, representing multiple secondary schools and vocational colleges. This diversity enhances the generalizability of findings regarding students' perceptions of Human Graphing as a pedagogical approach. The sample included students with prior experience in Human Graphing activities as well as novices, allowing for comparative insights into both experienced and inexperienced participants. Variation in grade level and prior exposure provides a robust understanding of how the activity is perceived across different student demographics. As illustrated in Figure 8, students were distributed across Forms 1 to 5.

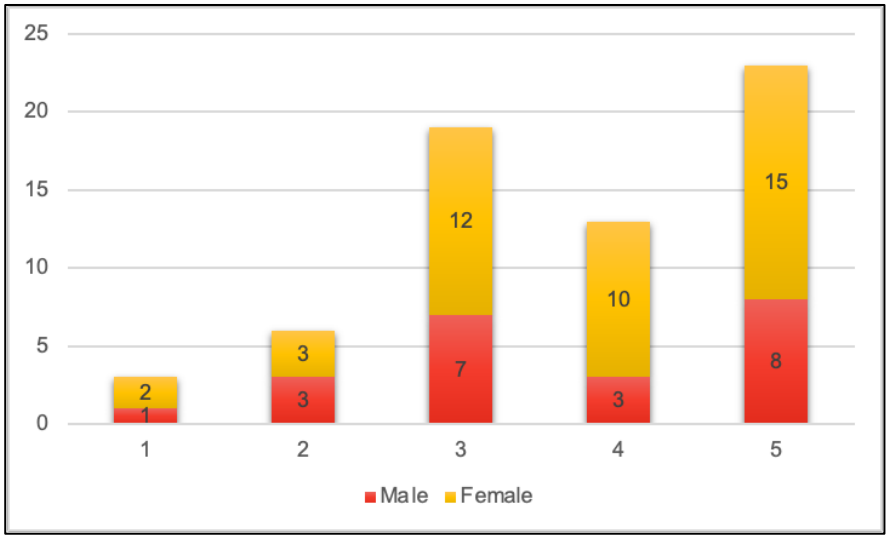

Fig. 8. Distribution of students by grade level (Form 1–5, n = 100)

3.2 Results and Discussion for Objective

The findings for Objective 1, which aimed to evaluate teachers' perceptions of the implementation of Human Graphing as a kinaesthetic learning tool in secondary schools, showed strong and consistent agreement among respondents. The reliability analysis demonstrated that the four items measuring teachers' perceptions possessed excellent internal consistency, with a Cronbach's Alpha value of 0.918 (Table 1), and all 40 responses were valid without any missing data (Table 2). The

descriptive analysis further indicated that teachers' perceptions were highly positive, with mean scores ranging from 4.03 to 4.18, and an overall mean of 4.11 (Table 3), reflecting a high level of acceptance of Human Graphing in the teaching process. Teachers agreed that Human Graphing is suitable for various subjects, helps clarify abstract concepts, increases student interest, and supports the explanation of relationships between variables. The standard deviation values between 0.71 and 0.76 suggested that teachers' responses were consistent and showed minimal variation across the sample.

Table 1
Reliability statistics

Cronbach's Alpha	N of Items
0.918	4

Table 2
Case processing summary

		N	%
Cases	Valid	40	100.0
	Excluded	0	0.0
	Total	40	100.0

a.Listwise deletion based on all variables in the procedure.

Table 3
Descriptive statistics for teachers' perceptions of Human Graphing

Item	N	Mean	SD
Human Graphing is suitable across subjects.	40	4.03	0.73
Human Graphing helps explain abstract concepts.	40	4.13	0.76
Human Graphing increases student interest.	40	4.18	0.71
Human Graphing helps explain variable relationships.	40	4.10	0.74
Overall Mean	40	4.11	0.74

The results indicate that teachers hold highly positive perceptions toward the implementation of Human Graphing, suggesting strong support for this kinaesthetic instructional approach. The high reliability value confirms that the perception items consistently measured teachers' views, which aligns with methodological recommendations for educational measurement [18]. Teachers' agreement that Human Graphing clarifies abstract concepts corresponds with research indicating that embodied and kinaesthetic learning enhances cognitive processing by making intangible ideas more concrete [11,12]. This finding is consistent with [10] which; problem-solving skills can be nurtured and learning could be strengthened through a holistic approach that integrates cognitive, physical, and environment.

The highest mean score, which showed strong belief that Human Graphing increases student interest, is consistent with previous findings that movement-based and physically interactive tasks promote motivation, focus, and engagement [13]. Furthermore, teachers' perception that Human Graphing is applicable across subjects supports the argument that kinaesthetic strategies are flexible and adaptable to different content areas, which is central to Gardner's [2] theory of multiple intelligences [2]. Overall, the discussion suggests that Human Graphing is not only accepted but also valued by teachers as an effective kinaesthetic learning tool capable of enhancing understanding, engagement, and instructional quality.

The findings for Objective 2, which aimed to assess students' perceptions of the effectiveness of Human Graphing in deepening their understanding and engagement in learning, showed overall positive and consistent responses from the participants. The reliability analysis conducted on the

four-item student perception scale indicated an acceptable level of internal consistency, with a Cronbach's Alpha value of 0.779 (Table 4). All 40responses were valid, with no missing data detected (Table 5). The corrected item-total correlation values exceeded 0.30 for all items, and the Cronbach's Alpha if Item Deleted values (0.668-0.775) were all lower than the overall alpha, confirming that every item contributed meaningfully to the scale's reliability. These findings indicate that the instrument was sufficiently robust for measuring students' perceptions of Human Graphing.

Descriptive statistics further demonstrated that students held favourable perceptions toward Human Graphing, with mean scores ranging from 3.68 to 4.11. These results reflect a high level of acceptance of Human Graphing as an effective and engaging learning activity. Students particularly agreed that Human Graphing captures their attention (M = 3.84) and that they enjoy learning through bodily movement (M = 4.11), which received the highest mean score. They also perceived that Human Graphing enhances their understanding of the topic (M = 3.68) and promotes better interaction with classmates (M = 4.10). The standard deviation values, which ranged between 0.86 and 0.96, indicate that student responses were relatively consistent across the sample (Table 6).

Table 4
Reliability statistics

Cronbach's Alpha	N of Items
0.779	4

Table 5
Case processing summary

		N	%
Cases	Valid	100	100.0
	Excluded	0	0.0
	Total	100	100.0

a.Listwise deletion based on all variables in the procedure.

Table 6
Descriptive statistics for students' perceptions of Human Graphing

Item	N	Mean	SD
Human Graphing is enjoyable and captures my attention.	100	3.84	0.90
I understand the topic better after participating in Human Graphing.	100	3.68	0.96
I enjoy learning through activities involving bodily movement.	100	4.11	0.89
Human Graphing encourages better interaction with classmates.	100	4.10	0.86
Overall Mean	100	3.93	0.91

The results indicate that students hold a positive perception of Human Graphing as an effective kinaesthetic learning tool, suggesting that the approach successfully enhances engagement and supports learning processes. The acceptable reliability coefficient aligns with recommendations by [19], who note that alpha values between 0.70 and 0.80 are suitable for educational research instruments. The high mean scores further support the argument that kinaesthetic and embodied learning activities increase cognitive engagement and deepen conceptual understanding by linking physical movement with mental processing [11,12]. The highest student rating, which reflects enjoyment of movement-based learning (M = 4.11), is consistent with previous research showing that active learning strategies boost motivation, attention, and knowledge retention [14,15]. Overall,

the findings suggest that Human Graphing is well-received by students and is perceived as both engaging and educationally beneficial. This demonstrates the value of integrating kinaesthetic instructional methods into classroom practice to enhance understanding, interaction, and active participation.

The findings for Objective 3 aimed to compare teachers' and students' perceptions regarding the effectiveness of Human Graphing in the teaching and learning process. Descriptive analysis revealed that teachers (M = 4.11, SD = 0.66) reported slightly higher perceptions of the effectiveness of Human Graphing than students (M = 3.93, SD = 0.70). The standard deviations for both groups were relatively similar, indicating comparable variability in responses. The standard error mean was lower for students (0.07) compared to teachers (0.10), reflecting greater stability in the student mean due to the larger sample size (n = 100) (Table 7).

Levene's Test for Equality of Variances indicated that the assumption of equal variances was met ($F = 1.084$, $p = 0.300 > 0.05$). Consequently, the "Equal variances assumed" row was used for interpretation of the Independent Samples t-test. The t-test results revealed $t(138) = 1.35$, $p = 0.181$, indicating that the difference between teachers' and students' perceptions was not statistically significant (Table 8). Although teachers reported a marginally higher mean perception, this difference was insufficient to be considered meaningful at the 0.05 significance level.

Table 7
Comparison of teachers' and students' perceptions of Human Graphing

	Group	N	Mean	Std. Deviation	Std. Error Mean
Perceptions	Teacher	40	4.11	0.66	0.10
	Student	100	3.93	0.70	0.07

Table 8
Independent samples test

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig	t	df	Sig. (2-tailed)
Perceptions	Equal variances assumed	1.084	0.300	1.35	138	0.181
	Equal variances not assumed			1.38	76.105	0.171

These results suggest that both teachers and students hold positive perceptions toward Human Graphing, and that the activity is generally regarded as effective by both groups. The findings are consistent with research indicating that kinaesthetic and movement-based instructional strategies enhance engagement, understanding, and interaction in the classroom [14]. Teachers' slightly higher mean may reflect professional experience and familiarity with pedagogical strategies, yet students' responses indicate strong appreciation of the activity for understanding concepts and promoting peer collaboration. The non-significant t-test result indicates that minor differences in group means do not necessarily reflect meaningful differences in perception. Overall, the discussion highlights that Human Graphing is positively received by both teachers and students, and that the activity is perceived as beneficial to teaching and learning without significant perceptual differences between the two groups. This supports the integration of Human Graphing as an effective kinaesthetic learning strategy that can enhance engagement, conceptual understanding, and classroom participation across multiple learner groups.

The findings for Objective 4 aimed to analyse the relationship between students' perceptions of Human Graphing and their level of understanding and memory in learning activities. A Pearson

correlation analysis was conducted with a sample of 100 students (N = 100), and the results revealed a very strong positive correlation between students' perceptions and their understanding and memory, with r = 0.796, p < 0.001 (Table 9). This indicates that as students' perceptions of Human Graphing become more positive, their level of understanding and memory in learning activities correspondingly increases. Figure 9 provides a visual illustration of this relationship, clearly demonstrating that higher perception scores are associated with higher levels of comprehension and retention, highlighting the consistency of the data with the statistical findings.

The significance value (p < 0.001) confirms that the correlation is statistically significant, indicating that the observed relationship is highly unlikely to have occurred by chance and represents a robust association within the sample. A correlation of 0.796 is considered very strong, indicating a substantial and meaningful relationship between students' perceptions and their learning outcomes. These results underscore the relevance of students' attitudes toward interactive, movement-based learning strategies in facilitating cognitive processing and memory consolidation.

Table 9
Pearson correlation between students' perceptions and understanding & memory

Perceptions	Understanding & Memory	Pearson r	Sig. (2-tailed)
Variable 1	Variable 2	0.796	0.000

(Note: p < 0.001; correlation is significant at the 0.01 level (2-tailed))

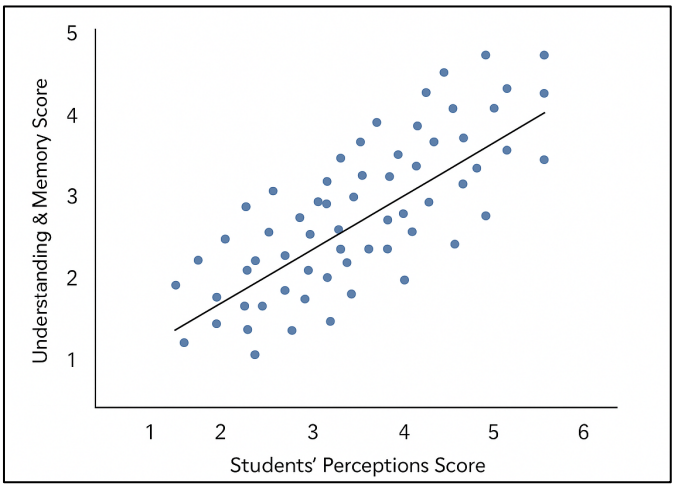

Fig. 9. Scatter plot showing the relationship between students' perceptions of Human Graphing and their understanding & memory

Furthermore, these findings highlight that students who value and actively engage with Human Graphing tend to achieve higher levels of understanding and retention. This observation aligns with prior research indicating that kinaesthetic and participatory learning approaches can significantly enhance cognitive engagement and long-term memory [15]. Overall, the analysis demonstrates that positive student perceptions of Human Graphing are closely linked to improved understanding and memory, reinforcing the pedagogical efficacy of incorporating interactive, experiential learning strategies into instructional practice.

4. Conclusions

The study findings indicate that both teachers and students hold positive perceptions of Human Graphing as an effective kinaesthetic learning strategy. Teachers reported that it clarifies abstract

concepts, increases interest, and supports variable interpretation, while students showed high engagement, enjoyment, and improved understanding. Although teachers' perceptions were slightly higher, the difference was not statistically significant. Furthermore, a very strong positive correlation was found between students' perceptions and their understanding and memory, suggesting that students who value Human Graphing tend to achieve better learning outcomes. These results demonstrate that Human Graphing is an effective instructional approach that enhances engagement, comprehension, and retention in classroom learning.

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