



Integrating an Anatomical Torso Model and Make a Match in Sixth-Grade Lessons on the Human Digestive System

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Abstract. This study was motivated by the low learning outcomes of sixth-grade students on the human digestive system topic at SDN Pleburan 04 Semarang, where only 42.9% of 21 students reached the minimum mastery criterion (KKM = 75) in the pre-cycle assessment, with a class average of 64.38. This action research aimed to describe the implementation of Torso media combined with the Make a Match cooperative learning model and to determine its effect on improving students' learning outcomes. The study used a Classroom Action Research (CAR) design following the Kemmis and McTaggart model, conducted in two cycles, each consisting of two meetings covering planning, action, observation, and reflection. Data were collected through written tests, observation sheets, interviews, and documentation, and analyzed using quantitative and qualitative techniques. The results showed that the class average score increased from 64.38 in the pre-cycle to 74.00 in Cycle I (61.9% mastery) and 84.57 in Cycle II (85.7% mastery), while teacher and student activity scores also improved from the "Good" to the "Very Good" category. Since the classical mastery in Cycle II exceeded the success indicator (75–80%), the research was stopped at Cycle II. The combination of Torso media and the Make a Match model is concluded to be effective in improving elementary students' learning outcomes on abstract, concrete-object-dependent topics such as the digestive system.

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Introduction

Science learning at the primary-school level requires instructional experiences that enable students to construct meaningful understanding rather than merely memorize factual information. This requirement becomes particularly important when scientific concepts involve processes or structures that cannot be directly observed. Contemporary evidence indicates that active learning can improve students' learning performance compared with conventional lecture-oriented instruction, although the magnitude and nature of the benefit depend on how active learning is designed and implemented. In elementary science, effective instruction therefore needs to provide opportunities for students to interact with representations, manipulate learning resources, communicate ideas, and connect new concepts with observable experiences. Research on elementary science has shown that active, hands-on, and interactive approaches can support

conceptual learning, engagement, and problem-solving, while the effectiveness of particular approaches varies according to the instructional design and the learning objectives being addressed (Freeman et al., 2014; Martella et al., 2020; Hodges et al., 2020).

The challenge is especially evident in learning about biological systems whose structures and processes occur inside the human body. The human digestive system represents a conceptually demanding topic because students are expected to understand not only the names and locations of organs but also the functional relationships and sequential processes connecting those organs. Research on digestive-system learning has documented persistent difficulties in developing an integrated understanding of its components, mechanisms, and processes. Evidence from instructional interventions suggests that physical models and role-play can contribute differently to understanding: physical models can help learners represent system components, whereas role-play can support understanding of mechanisms and relationships among processes (Uskola et al., 2024). Recent research in elementary education likewise reports that students experience difficulties understanding the human digestive system when instruction relies heavily on conventional learning media, highlighting the need for concrete, engaging, and interactive representations (Juhariyani et al., 2026). These findings are relevant to primary-school science because the digestive system cannot be directly observed during ordinary classroom learning, making representation a central component of conceptual development.

The instructional problem identified in the present study reflects this broader conceptual challenge. Based on the researcher's initial observation in Grade VI at SDN Pleburan 04 Semarang, many students experienced difficulties remembering the names of digestive organs, sequencing the digestive process, explaining relationships among organs, understanding digestive disorders, and connecting the topic with everyday life. The initial assessment provides a clear indication of the problem: among 21 students, only 9 students (42.9%) achieved the school-established *Kriteria Ketercapaian Tujuan Pembelajaran* (KKTP) of 75, whereas 12 students (57.1%) remained below the criterion. The class mean was 64.38. The observed condition was associated with teacher-centered instruction dominated by explanation, limited active student participation, and insufficient use of media capable of representing digestive organs concretely. The discrepancy between the expected mastery criterion and the observed achievement indicates that instructional improvement was required rather than merely additional exposure to the same content. The study consequently established a target of at least 85% classical mastery as the basis for evaluating improvement.

One important response to this problem is to strengthen the representational quality of science instruction. Concrete and three-dimensional representations can provide learners with perceptual access to structures that are otherwise invisible or difficult to imagine. Research on multiple representations indicates that models, visualizations, and other external representations can facilitate learning when they help students connect observable features with underlying concepts. Evidence from science education has also demonstrated that three-dimensional models and animations can influence students' learning and motivation, although the effectiveness of visualization depends on how it is integrated into instruction rather than on visual presentation alone (Teplá et al., 2022). Similarly, research comparing different representations in science learning emphasizes that hands-on experiences and models provide opportunities for learners to engage directly with scientific phenomena and representations (Krüger et al., 2022; Ponsa &

Wati, 2025). The role of concrete representation should therefore not be reduced to making lessons more attractive; its instructional value lies in supporting the transformation of difficult-to-observe structures into representations that students can inspect, manipulate, discuss, and relate to conceptual explanations.

The potential contribution of concrete representation is also consistent with research on multimedia and conceptual learning. The cognitive theory of multimedia learning explains that meaningful learning requires learners to select relevant information, organize it into coherent verbal and visual structures, and integrate those structures with prior knowledge. This theoretical perspective supports the use of appropriately designed visual representations when learning content contains relationships that are difficult to understand from verbal explanations alone (Mayer, 2024). Research in science education further indicates that instructional strategies designed to address students' existing misconceptions can produce substantial improvements in conceptual understanding, although effects vary considerably across studies and contexts (Pacaci et al., 2024). Evidence from biology education specifically shows that combining physical models with other representational activities can deepen students' understanding of biological systems, suggesting that representations become more productive when they are embedded within purposeful learning activities rather than presented as passive demonstrations (Uskola et al., 2024).

Concrete media alone, nevertheless, do not guarantee active conceptual engagement. The pedagogical structure surrounding the media determines whether students merely observe a model or actively use it to construct understanding. Research on cooperative and inquiry-oriented science learning emphasizes the importance of interaction, explanation, peer support, and teacher scaffolding in helping students develop scientific understanding. Cooperative learning can provide opportunities for students to articulate ideas, compare interpretations, and participate in shared problem solving, while inquiry-oriented approaches can strengthen engagement with scientific processes (Gillies, 2023; Spires et al., 2022). Evidence from primary education also indicates that playful learning can involve cognitive, social, and physical engagement when teachers deliberately plan, facilitate, and assess the activity rather than treating play as an unstructured classroom diversion (Li & Kangas, 2024). These findings provide a rationale for incorporating an interactive cooperative structure into science lessons, particularly when students need to connect visual representations with conceptual information.

Within this instructional perspective, the cooperative *Make a Match* model offers a potentially relevant mechanism for increasing student participation. The model requires students to identify corresponding question-and-answer cards and to interact with peers while searching for the appropriate match. Its value for the present context lies in its capacity to transform conceptual recall into an active matching task involving movement, attention, peer interaction, and immediate decision making. Research on active learning has shown that the effectiveness of an instructional activity depends partly on how students are cognitively engaged in the task, rather than simply on whether an activity is labeled "active" (Martella et al., 2020). Research on game-based and cooperative science activities similarly indicates that structured collaborative tasks can promote engagement, motivation, and problem-solving opportunities among elementary students (Huang et al., 2020; Huang et al., 2020; Gillies, 2023). The *Make a Match* approach can consequently complement a concrete model by requiring students to retrieve, recognize, and verbally connect information after encountering the corresponding physical representation. Existing evidence also demonstrates that interactive learning should not be understood

as uniformly superior to conventional instruction.

Studies of active learning, inquiry, simulations, games, and multimedia have reported positive effects but have also identified differences according to learner characteristics, instructional design, content, and implementation. For example, interactive multimedia has been found to benefit science achievement among some groups of elementary learners, while the relative effectiveness of different technology-supported approaches can vary according to students' abilities and educational contexts (Adeyele, 2024). Research on inquiry-supported simulation similarly shows that interactive environments can support scientific literacy without necessarily producing uniform gains in conventional science achievement (Wen et al., 2020). Evidence on concreteness also cautions against assuming that simply introducing concrete representations automatically produces superior learning outcomes; comparisons between different sequences of concrete and abstract representations have produced more nuanced findings (Kokkonen et al., 2022). These findings suggest that the instructional contribution of a concrete model is best examined in combination with an active pedagogical structure rather than evaluated as an isolated classroom resource.

The literature consequently provides substantial evidence for the separate importance of concrete or visual representations and active or cooperative learning, but the evidence does not directly establish whether integrating a three-dimensional human-body model with the specific *Make a Match* cooperative procedure can address learning difficulties in the Grade VI human digestive-system topic. Existing studies have examined physical models and multiple representations in biological-system learning, while other studies have investigated cooperative, playful, inquiry-based, or *Make a Match*-type activities as mechanisms for increasing participation and achievement. The evidence therefore remains fragmented across instructional components, content areas, educational levels, and methodological contexts. The present classroom problem further provides an empirical basis for examining this integration because the participating students demonstrated low initial mastery, with only 42.9% reaching the KKTP of 75 and a class mean of 64.38. The unresolved issue is not whether media or active learning can be useful in general, but whether their deliberate integration can improve learning outcomes for students who are experiencing difficulty understanding a structurally and functionally complex biological system.

This unresolved issue constitutes the research gap addressed by the present classroom action research. The study does not claim that no previous research has examined either torso-based instruction or *Make a Match*. Rather, the gap concerns the limited evidence on the integrated use of a concrete torso model and the *Make a Match* cooperative learning procedure for the human digestive-system topic in Grade VI primary education, particularly within a classroom improvement cycle that responds to observed learning difficulties. The research is therefore designed to examine both the implementation of the integrated instructional strategy and its contribution to students' learning outcomes. The use of classroom action research is appropriate because the instructional problem is situated in an actual classroom and requires iterative improvement through planning, action, observation, and reflection (Ramadhani et al., 2026). The two-cycle structure also enables instructional adjustments to be made in response to evidence obtained during the first cycle rather than treating the intervention as a fixed procedure. This orientation is consistent with research demonstrating the value of iterative and teacher-guided active learning in improving students' participation and understanding (Spires et al., 2022 ; Senisum et al., 2022).

Against this background, the present study asks two questions: (1) How can the torso media be implemented through the cooperative *Make a Match* learning model in teaching the human digestive-system topic in Grade VI? and (2) To what extent can the integrated use of torso media and the cooperative *Make a Match* model improve students' learning outcomes on the human digestive-system topic? The study aims to describe the implementation of the integrated instructional approach and to determine its contribution to improving students' learning outcomes. Its contribution lies in connecting two complementary instructional functions: the torso provides a concrete three-dimensional representation of digestive organs, while *Make a Match* creates a structured social and game-based activity through which students retrieve, match, discuss, and reinforce the corresponding concepts. The novelty of the study therefore lies in the instructional integration of concrete anatomical representation and cooperative matching activity within a two-cycle classroom action research design for Grade VI learning of the human digestive system, rather than in claiming that either the torso medium or *Make a Match* model is individually novel. The study consequently provides classroom-level evidence concerning how these two components can be coordinated to address an identified conceptual-learning problem.

Method

Research Setting, Participants, and Sampling

This study employed a Classroom Action Research (CAR) design to improve students' learning outcomes and learning activities in IPAS, particularly on the human digestive system, through the implementation of the cooperative learning model *Make a Match* supported by a torso teaching medium. The study adopted the Kemmis and McTaggart action research cycle, consisting of planning, acting, observing, and reflecting. The intervention was planned for two cycles, with each cycle comprising two meetings of 2 × 35 minutes. A subsequent cycle was to be conducted if the predetermined success criteria had not been achieved. The research was implemented collaboratively by the researcher, a peer observer, and the Grade VI classroom teacher. The researcher conducted the learning activities, the peer observer assessed student activities, and the classroom teacher served as Observer I to assess teacher activities.

The study was conducted in Grade VI at SDN Pleburan 04, located at Jl. Kusuma Wardani No. 1, Pleburan, South Semarang District, Semarang City, Central Java. The research setting was selected based on preliminary observations indicating that students' learning outcomes in IPAS, particularly on the digestive system topic, were relatively low. The intervention therefore combined the *Make a Match* cooperative learning model with a torso teaching medium to support students' engagement and learning outcomes. The study was planned to be conducted over two weeks in August 2026, during the first semester of the 2026/2027 academic year. The schedule followed the school's regular instructional timetable. Preparatory activities included an initial observation at the school and obtaining permission from the school, particularly from the principal and Grade VI classroom teacher. The participants comprised all 21 Grade VI students of SDN Pleburan 04 Semarang in the 2026/2027 academic year, consisting of 9 male and 12 female students. As the study involved the entire Grade VI class, the participants constituted the classroom-level research subjects. The primary focus was students' cognitive learning outcomes and learning activities in IPAS on the human digestive system following the implementation of the *Make a Match* cooperative learning model supported by a torso teaching medium. Because the study focused on a single intact Grade VI classroom, all 21

students in the class participated in the research. No separate respondent selection procedure was reported in the original design. Accordingly, the study used the entire class as the research participants, rather than selecting a subset of students. The classroom teacher and peer observer participated as collaborators in observing the implementation of the intervention and student activities.

Data Collection Techniques

Data were collected using tests and non-test techniques. The test technique was used to measure students' cognitive learning outcomes before and after the intervention. A written test was administered at the pre-cycle stage and at the end of each action cycle. The non-test techniques consisted of observation, interviews, and documentation. Observation was conducted throughout the learning process to record teacher activities, student activities, classroom conditions, and the implementation of learning activities using the *Make a Match* model and torso medium. Student observations focused on learning activities, preparation, participation, and evaluation-related activities, while teacher observations addressed instructional preparation and implementation. Interviews were conducted to obtain supporting information concerning students' responsibility and learning outcomes during the learning process. Documentation was used as supplementary evidence of the learning activities and consisted primarily of photographs documenting student participation during the instructional process. Observation and interview data were used as supporting qualitative information, whereas the principal quantitative outcome data were obtained from the students' written tests.

Research Instrument and Measurement

The research instruments consisted of observation sheets and written cognitive achievement tests. The observation instrument was designed to record teacher activities and student cooperation and participation during learning using the torso medium and *Make a Match* cooperative learning model. The teacher activity observation sheet was completed by the designated observer, while student activities were monitored during the implementation of the intervention. The cognitive learning outcome instrument was a written test covering the human digestive system. The assessment was administered at three stages: the pre-cycle test, Cycle I evaluation, and Cycle II evaluation. Each cycle used a 15-item test consisting of multiple-choice and matching questions, with four answer options. The pre-cycle test was administered before the intervention to identify students' initial understanding, whereas the Cycle I and Cycle II evaluations were administered at the end of the respective cycles following instruction using the *Make a Match* model supported by the torso medium.

The data analysis also included observation scores and students' test scores. Observation data were converted into percentages based on the proportion of checklist items fulfilled relative to the total number of observation items. Student achievement was analyzed through individual scores, mean scores, and the proportion of students achieving the minimum mastery criterion (KKM) of 75. The final student score was calculated based on the number of correct responses relative to the total number of test items.

Data Analysis Techniques

The study used both qualitative and quantitative data analysis. Qualitative data obtained from student activity observations and interviews were analyzed descriptively

to identify changes in students' activity, enthusiasm, responses, and participation during IPAS instruction. Quantitative data obtained from the pre-cycle, Cycle I, and Cycle II cognitive tests were analyzed to examine changes in students' learning outcomes across the action cycles. Observation data were analyzed using percentage calculations based on the number of checklist items fulfilled relative to the total number of items. The resulting percentages were interpreted according to the observation criteria specified in the research instrument. Student test data were analyzed by calculating individual achievement scores, the class mean, and the percentage of students who achieved the KKM. The level of learning mastery was determined from the proportion of students obtaining scores of at least 75.

The action research procedure followed the Kemmis and McTaggart cycle of planning, acting, observing, and reflecting. During the planning stage, the researcher and teacher prepared the IPAS teaching module on the digestive system, learning scenarios, pre-cycle and cycle evaluation tests, *Make a Match* cards, and data-collection instruments. During the action stage, the researcher implemented the planned instruction. In Cycle I, the teacher demonstrated digestive organs using the torso medium, explained the *Make a Match* procedure, and facilitated students in matching cards containing organ names and their basic functions. The activity was followed by student presentations, answer confirmation, and the Cycle I evaluation test.

During the observation stage, the researcher and observers recorded teacher and student activities using the prepared observation instruments. The reflection stage involved reviewing observation findings, evaluation results, field notes, and discussions with the observers to identify aspects requiring improvement. Cycle II was implemented as an improvement based on the Cycle I reflection. It used more advanced *Make a Match* cards addressing digestive enzymes and digestive disorders, together with contextual reinforcement through case-based student worksheets (LKPD) involving everyday-life situations. If the research objectives had not been achieved by the end of Cycle II, a further cycle was planned. The principal indicator of successful action was an improvement in students' learning outcomes, with individual achievement expected to reach the KKM of 75 or the corresponding high-performance criterion. The observation and test data were therefore considered jointly when reflecting on the implementation and determining subsequent action.

Ethical Considerations

This study was conducted under the authorization provided by Sultan Agung Islamic University (UNISSULA) through Notification Letter No. 816/A.1/FKIP-SA/VII/2026, dated July 16, 2026, concerning the implementation of an independent teaching practicum (PPL). The letter served as the basis for conducting teaching and learning activities as well as the research at UPTD SDN Pleburan 04. Throughout the study, the confidentiality of the students' identities was strictly maintained, and no personally identifiable information was included in the research report. All data collected were used exclusively for academic purposes and were managed, analyzed, and reported responsibly in accordance with applicable academic and ethical principles.

Results and Discussion

Results

Research Results

This classroom action research was conducted with Grade 6 students at SDN Pleburan 04 Semarang as part of an IPAS learning unit on the human digestive system. The study was implemented in two cycles, with each cycle comprising two meetings and following the stages of planning, action, observation, and reflection. Cycle I was conducted on 18 and 19 August 2026, while Cycle II was conducted on 24 and 27 August 2026. Data were collected through learning achievement tests, teacher implementation observations, student activity observations, and documentation. The success criteria were defined as an individual score of at least 75, based on the established learning mastery criterion (KKTP), and a minimum classical mastery level of 75% of the 21 students.

Baseline Results

Baseline data were collected before the implementation of cooperative learning through *Make a Match* supported by torso media. The results indicated that student achievement had not yet reached the predetermined mastery criteria.

Table 1. *Students' Learning Achievement at Baseline*

No.	Student	Score	Status
1	1	64	Not mastered
2	2	58	Not mastered
3	3	76	Mastered
4	4	58	Not mastered
5	5	52	Not mastered
6	6	52	Not mastered
7	7	88	Mastered
8	8	76	Mastered
9	9	76	Mastered
10	10	76	Mastered
11	11	76	Mastered
12	12	94	Mastered
13	13	94	Mastered
14	14	46	Not mastered
15	15	52	Not mastered
16	16	76	Mastered
17	17	58	Not mastered
18	18	46	Not mastered
19	19	40	Not mastered
20	20	40	Not mastered
21	21	58	Not mastered
Total	21	1,356	—
Mean	—	64.57	—
Minimum	—	40	—
Maximum	—	94	—

Table 1 presents the individual learning achievement scores of the 21 students before the intervention. The scores ranged from 40 to 94, with a total score of 1,356 and a mean of 64.57. Nine students achieved scores of at least 75, whereas 12 students scored below the mastery criterion. These results indicate that baseline achievement had not yet reached the predetermined classical mastery criterion.

Table 2. *Learning Mastery at Baseline*

Category	Number of Students	Percentage
Mastered (≥ 75)	9	42.9%
Not mastered (< 75)	12	57.1%

Total	21	100%
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Table 2 summarizes the distribution of students according to the predetermined mastery criterion. Nine students (42.9%) achieved scores of at least 75, while 12 students (57.1%) remained below the criterion. The classical mastery level of 42.9% was substantially below the required threshold of 75%. Thus, the baseline results established that the learning achievement target had not been attained before the implementation of the intervention.

Cycle I Results

Planning

The Cycle I planning stage involved the preparation of instructional materials for the human digestive system, torso media, *Make a Match* cards, student worksheets, teacher implementation observation instruments, student activity observation instruments, and learning achievement tests. The instructional materials were designed to engage students in matching activities, group discussion, explanation of reasoning, and connections between the learning materials and the human digestive system.

Implementation

Cycle I was conducted over two meetings on 18 and 19 August 2026. The learning activities employed cooperative learning through *Make a Match* supported by torso media. Students participated in activities involving observation, card matching, group discussion, explanation of their reasoning, and presentation of group results. A learning achievement test was administered at the end of the cycle.

Observation and Learning Achievement Results

The teacher implementation observation in Cycle I produced a total score of 59 across 14 indicators, corresponding to a mean score of 4.21 and a very good category. Student activity observation produced a total score of 37 across 10 indicators, with a mean score of 3.70 and a good category. The ten student activity indicators covered problem comprehension, observation of the learning media, discussion, explanation of reasoning, respect for others' opinions, conceptual connections, consideration of consequences, collaboration, presentation, and reflection.

Table 3. Students' Learning Achievement in Cycle I

No.	Student	Score	Status
1	1	76	Mastered
2	2	76	Mastered
3	3	76	Mastered
4	4	76	Mastered
5	5	64	Not mastered
6	6	64	Not mastered
7	7	94	Mastered
8	8	76	Mastered
9	9	76	Mastered
10	10	82	Mastered
11	11	76	Mastered
12	12	94	Mastered
13	13	94	Mastered
14	14	58	Not mastered
15	15	64	Not mastered
16	16	82	Mastered
17	17	76	Mastered
18	18	58	Not mastered

No.	Student	Score	Status
19	19	52	Not mastered
20	20	52	Not mastered
21	21	64	Not mastered
Total	21	1,554	—
Mean	—	74.00	—
Minimum	—	52	—
Maximum	—	94	—

Table 3 presents the individual learning achievement scores obtained after the first action cycle. The total score increased to 1,554, with a mean of 74.00, while individual scores ranged from 52 to 94. Thirteen students achieved the minimum mastery score of 75, whereas eight students remained below the criterion. Compared with baseline, the mean score increased by 9.43 points.

Table 4. Learning Mastery in Cycle I

Category	Number of Students	Percentage
Mastered (≥ 75)	13	61.9%
Not mastered (< 75)	8	38.1%
Total	21	100%

Table 4 shows the distribution of students' learning mastery following Cycle I. The number of students achieving scores of at least 75 increased from 9 at baseline to 13 in Cycle I, corresponding to an increase in classical mastery from 42.9% to 61.9%. Although this represented a 19.0 percentage-point increase, the resulting mastery level remained below the predetermined criterion of 75%.

Cycle I Reflection

The reflection conducted after Cycle I identified several aspects of the learning process that required adjustment before the implementation of Cycle II. The student worksheet instructions were simplified and reformulated into clearer, more specific directions to reduce ambiguity during task completion. Group roles were clarified to ensure a more balanced distribution of responsibilities among members, particularly during discussion and card-matching activities. Opportunities for students to express ideas and provide responses were also regulated more systematically to facilitate orderly participation during group interaction. Additional step-by-step guidance was incorporated into the subsequent learning activities to provide structured support during the observation, matching, discussion, and presentation stages. These adjustments were intended to address the procedural issues identified during Cycle I while maintaining the core instructional activities of *Make a Match* supported by torso media.

Cycle II Results

Planning

Planning for Cycle II was based on the findings from the Cycle I reflection. The planned improvements focused on simplifying the student worksheet instructions, clarifying group roles, regulating turn-taking during discussions, and providing gradual *scaffolding* throughout the learning activities. The torso media and *Make a Match* cards continued to be used as components of the instructional intervention.

Implementation

Cycle II was conducted on 24 and 27 August 2026. The learning activities continued to employ cooperative learning through *Make a Match* supported by torso media, incorporating the improvements identified during Cycle I reflection. Students

participated in observation, card-matching activities, group discussion, explanation of reasoning, presentation, and reflection. A learning achievement test was administered at the end of the cycle.

Observation and Learning Achievement Results

In Cycle II, teacher implementation observation produced a total score of 68 across 14 indicators, corresponding to a mean score of 4.86 and a very good category. Student activity observation produced a total score of 48 across 10 indicators, with a mean score of 4.80 and a very good category.

Table 5. Students' Learning Achievement in Cycle II

No.	Student	Score	Status
1	1	88	Mastered
2	2	82	Mastered
3	3	88	Mastered
4	4	82	Mastered
5	5	76	Mastered
6	6	76	Mastered
7	7	100	Mastered
8	8	94	Mastered
9	9	88	Mastered
10	10	100	Mastered
11	11	94	Mastered
12	12	94	Mastered
13	13	94	Mastered
14	14	76	Mastered
15	15	76	Mastered
16	16	100	Mastered
17	17	88	Mastered
18	18	76	Mastered
19	19	70	Not mastered
20	20	64	Not mastered
21	21	70	Not mastered
Total	21	1,776	—
Mean	—	84.57	—
Minimum	—	64	—
Maximum	—	100	—

Table 5 presents the individual learning achievement scores following the second action cycle. The total score reached 1,776, with a mean of 84.57 and individual scores ranging from 64 to 100. Eighteen of the 21 students achieved scores of at least 75, while three students remained below the mastery criterion. The mean score increased by 10.57 points compared with Cycle I.

Table 6. Learning Mastery in Cycle II

Category	Number of Students	Percentage
Mastered (≥ 75)	18	85.7%
Not mastered (< 75)	3	14.3%
Total	21	100%

Table 6 summarizes students' mastery following Cycle II. Eighteen students (85.7%) achieved scores of at least 75, while three students (14.3%) remained below the criterion. Classical mastery increased by 23.8 percentage points from Cycle I and by 42.8 percentage points from baseline. The resulting mastery level of 85.7% exceeded the predetermined classical mastery criterion of 75%.

Cycle II Reflection

At the end of Cycle II, 18 of the 21 students achieved a learning achievement score of at least 75, whereas three students remained below the individual mastery criterion. The mean score reached 84.57, with individual scores ranging from 64 to 100. The classical mastery level increased to 85.7%, representing an increase of 23.8 percentage points compared with Cycle I and 42.8 percentage points compared with the baseline assessment. The final classical mastery level exceeded the predetermined criterion of 75%. This attainment, together with the observed results of teacher implementation and student activity, marked the fulfillment of the predetermined success criteria and concluded the classroom action research after Cycle II.

Overall Changes in Learning Achievement and Observational Results

The development of students' learning achievement from baseline through Cycle II is presented in Table 7.

Table 7. Summary of Students' Learning Achievement

Stage	Total Score	Mean	Minimum	Maximum	Students Mastered	Mastery
Baseline	1,356	64.57	40	94	9	42.9%
Cycle I	1,554	74.00	52	94	13	61.9%
Cycle II	1,776	84.57	64	100	18	85.7%

Table 7 summarizes the development of learning achievement across the baseline, Cycle I, and Cycle II stages. The mean score increased progressively from 64.57 at baseline to 74.00 in Cycle I and 84.57 in Cycle II. Classical mastery also increased from 42.9% to 61.9% and subsequently to 85.7%, indicating that the predetermined mastery criterion was reached at the end of Cycle II.

Table 8. Changes in Learning Achievement Across Stages

Comparison	Change in Mean Score	Change in Classical Mastery
Baseline → Cycle I	+9.43 points	+19.0 percentage points
Cycle I → Cycle II	+10.57 points	+23.8 percentage points
Baseline → Cycle II	+20.00 points	+42.8 percentage points

Table 8 presents the changes in mean learning achievement and classical mastery between successive stages of the intervention. The mean score increased by 9.43 points from baseline to Cycle I and by a further 10.57 points from Cycle I to Cycle II. Across the full intervention period, the mean increased by 20.00 points, while classical mastery increased by 42.8 percentage points.

Students' mean learning achievement demonstrated a progressive increase across the three assessment stages, rising from 64.57 at baseline to 74.00 in Cycle I and 84.57 in Cycle II. This pattern corresponds to an overall increase of 20.00 points from baseline to Cycle II. Classical mastery followed a similar pattern, increasing from 42.9% at baseline to 61.9% in Cycle I and 85.7% in Cycle II, representing an overall increase of 42.8 percentage points. The proportion of students achieving the minimum score of 75 therefore increased from 9 students at baseline to 13 students in Cycle I and 18 students in Cycle II. The final classical mastery level of 85.7% exceeded the predetermined criterion of 75%, while three students remained below the individual mastery threshold at the end of Cycle II. These findings indicate that the predefined learning achievement criterion was reached at the completion of the second action cycle.

Discussion

Improvement in Students' Learning Achievement

The findings show progressive improvement in students' learning achievement

following the implementation of *Make a Match* supported by torso media across two classroom action research cycles. The class mean increased from 64.57 at baseline to 74.00 in Cycle I and 84.57 in Cycle II, while classical mastery increased from 42.9% to 61.9% and 85.7%, respectively. The overall gain of 20.00 points in mean achievement and 42.8 percentage points in mastery indicates substantial classroom improvement. Given the absence of a control group and inferential statistical testing, these changes are interpreted as improvement occurring during the intervention cycles rather than definitive evidence of causal effects. The baseline condition indicates that 12 of 21 students had not reached the individual mastery criterion of 75. Learning the digestive system requires students to coordinate knowledge of anatomical structures, functions, and sequential processes, which may be challenging when concepts are presented primarily through verbal explanation. Meaningful learning benefits from integrating verbal and visual representations with prior knowledge and active cognitive processing (Mayer, 2024).

Cycle I showed an increase of 9.43 points in the class mean and an increase in mastery from 9 to 13 students. This improvement coincided with very good teacher implementation and good student activity. Active learning can promote achievement when students engage in retrieval, explanation, comparison, and feedback rather than merely receiving information (Freeman et al., 2014). Reflection after Cycle I identified unclear worksheet instructions, uneven group responsibilities, and the need for more systematic regulation of student participation. These findings highlight the importance of structured interaction and teacher facilitation in cooperative learning (Gillies, 2023). Cycle II incorporated clearer instructions, explicit group roles, regulated turn-taking, and gradual scaffolding. Teacher implementation increased from 4.21 to 4.86, while student activity increased from 3.70 to 4.80. Mean achievement subsequently increased from 74.00 to 84.57, and classical mastery reached 85.7%, exceeding the 75% success criterion. The parallel improvement in implementation, student activity, and achievement provides descriptive evidence that the second cycle occurred under more supportive classroom conditions.

The findings also extend classroom-level evidence concerning *Make a Match* in primary science by applying the approach to human digestive-system learning and integrating it with concrete torso representation. The three students who remained below the mastery criterion, with scores of 70, 64, and 70, indicate that whole-class improvement does not necessarily resolve individual learning difficulties. Additional guided practice, differentiated explanation, repeated retrieval, or targeted support may therefore be required for students whose conceptual understanding remains incomplete.

Complementary Role of Torso Media and *Make a Match*

The instructional value of the intervention can be understood through the complementary functions of the torso medium and *Make a Match*. The torso provided a three-dimensional representation of digestive organs, supporting observation of structures and spatial relationships that are difficult to inspect directly. The *Make a Match* activity then required students to retrieve, identify, compare, and communicate related information. The two components thus served interconnected functions: the torso supported visual and spatial representation, while *Make a Match* promoted retrieval and social interaction. The use of three-dimensional representation is consistent with evidence that visual models can support science learning when embedded within appropriate instructional activities (Teplá et al., 2022). The torso in this study was not used solely for demonstration; students observed it, connected it with card information,

discussed relationships, and explained their answers. This active integration of visual and verbal information is also consistent with the cognitive theory of multimedia learning, which emphasizes selecting, organizing, and integrating information across representations (Mayer, 2024).

The *Make a Match* procedure added cognitive and social engagement by requiring students to identify corresponding information, compare alternatives, explain responses, and interact with peers. Such structured collaboration can support learning when students have meaningful responsibilities and receive appropriate teacher facilitation (Gillies, 2023). The playful element also depended on careful instructional design. Effective playful learning requires teacher planning, guidance, supervision, and reflection rather than playfulness alone (Li & Kangas, 2024). The improvement in student activity from 3.70 in Cycle I to 4.80 in Cycle II therefore reflects not simply the use of a game-like activity but the refinement of its implementation.

The integration of concrete representation and conceptual interaction was particularly relevant to digestive-system learning, which involves interconnected organs, functions, sequences, and processes. The torso made anatomical structures more accessible, while the matching activity provided repeated opportunities to connect visual information with verbal and conceptual knowledge. This interpretation is consistent with evidence that structured conceptual-change strategies can support science learning, although outcomes vary across contexts (Pacaci et al., 2024). Because conceptual change and misconceptions were not directly measured, the findings should be interpreted as evidence of improved achievement on the targeted assessments rather than proof that misconceptions were eliminated.

Theoretical and Practical Implications

The theoretical contribution of this study lies in demonstrating how concrete representation and cooperative activity can be integrated within an elementary science classroom rather than treated as isolated instructional components. While previous research has examined active learning, visual representation, cooperative learning, and playful learning separately, this study provides contextual classroom-level evidence from a Grade VI digestive-system unit in which torso media and *Make a Match* were intentionally combined. The contribution is therefore instructional and contextual rather than a claim of pedagogical novelty. The findings further indicate that active learning depends on purposeful instructional design. The increase in student activity from 3.70 in Cycle I to 4.80 in Cycle II followed improvements in instructions, group responsibilities, turn-taking, and scaffolding. This pattern supports the view that meaningful participation requires structured teacher facilitation and opportunities for cognitive engagement (Freeman et al., 2014; Gillies, 2023; Li & Kangas, 2024).

For elementary science teachers, the findings suggest that concrete anatomical media can be integrated with observation, retrieval, peer interaction, explanation, and reflection rather than used only for demonstration. Teachers should provide clear instructions, defined group roles, regulated interaction, and appropriate scaffolding when implementing *Make a Match* to maintain students' focus on conceptual learning. The Cycle II improvements also illustrate the practical value of reflection in identifying classroom difficulties and refining instructional procedures within classroom action research. The findings have implications for students who do not initially reach the mastery criterion. The three students who remained below 75% after Cycle II indicate that whole-class improvement does not necessarily address every learner's difficulty. Targeted

remediation, additional visual support, small-group explanation, and repeated practice may therefore be needed to strengthen understanding of interconnected concepts in the digestive system.

Limitations and Future Research

Several limitations should be considered when interpreting the findings. The study involved only 21 students from one Grade VI classroom in a single elementary school. Although an intact classroom is appropriate for classroom action research, the findings cannot be generalized directly to other schools, grade levels, or student populations because instructional outcomes may vary according to teacher expertise, classroom characteristics, resources, curriculum implementation, and students' prior knowledge. The absence of a comparison group also limits causal interpretation. The increases in mean achievement from 64.57 to 74.00 and 84.57 occurred alongside the intervention and cycle refinements, but repeated instruction, familiarity with the content and assessment format, and other learning experiences may also have contributed to the improvement. The descriptive analysis further means that the study did not estimate statistical significance, effect size, or the independent contribution of torso media and *Make a Match*. Previous research similarly indicates that instructional outcomes may vary across learning designs and contexts (Teplá et al., 2022; Adeyele, 2024).

The assessment focused on immediate classroom achievement and did not measure long-term retention, conceptual change, transfer, or misconceptions. Future studies should therefore employ larger and more diverse samples, comparative or experimental designs, delayed assessments, and diagnostic measures to examine the durability and transferability of learning. Comparisons among integrated torso-*Make a Match* instruction, torso-supported instruction alone, and *Make a Match* without torso media could also clarify the contribution of each instructional component. The present study provides classroom-level evidence that combining concrete torso representation with structured cooperative *Make a Match* activities can support iterative instructional improvement in human digestive-system learning. The findings demonstrate pedagogical feasibility within the participating classroom, while broader comparative and longitudinal research is needed to determine the extent and durability of these outcomes across different educational contexts.

Conclusion

This study demonstrates that integrating torso media with the cooperative *Make a Match* learning model can support the improvement of Grade VI students' learning achievement in human digestive-system learning. Across two classroom action research cycles, the mean achievement score increased from 64.57 at baseline to 74.00 in Cycle I and 84.57 in Cycle II, while classical mastery increased from 42.9% to 61.9% and finally to 85.7%, exceeding the 75% success criterion. Student activity also improved from 3.70 to 4.80, accompanied by stronger teacher implementation from 4.21 to 4.86. The findings indicate that combining concrete anatomical representation with structured cooperative interaction can facilitate observation, conceptual connection, discussion, and explanation during science learning. The study contributes classroom-level evidence of the pedagogical feasibility of this integrated approach, while its single-class setting, absence of a comparison group, and descriptive design limit broader causal and generalizable conclusions. Future research should employ larger samples, comparative designs, and delayed assessments to examine the durability and transferability of the learning

outcomes.

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