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Didactic student workbook in human anatomy and physiology: Implementation in undergraduate biology education

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ABSTRACT
A didactic student workbook has been used to teach human anatomy and physiology. The didactic workbook has significantly reduced the disparity between teaching materials and students. It accommodated all student learning styles, integrated with *asma al-husna* (the best names are based on the characteristics of God). This workbook also integrates contemplative exercises. The purpose of this study was to investigate the learning outcomes and responses of students after utilizing the didactic workbook in their learning process. The study used a quasi-experimental methodology with a pre-test-post-test control group design. It involved 31 biology education students from UIN Mahmud Yunus Batusangkar. The experimental group was given homework assignments to complete in the didactic workbook, whereas the control group was given the task of summarising and answering the questions in the textbook. Both groups used the discussion method during in-class learning. Essay tests and student response questionnaires were used to collect data. The *t*-test was used to compare the N-gain of learning outcomes between the experimental and control groups. Descriptive analyses were conducted to examine student responses. The didactic workbook was significantly effective ($p<0.05$) in improving learning outcomes compared to the control class. The didactic student workbook was also responded to very positively by students. These findings indicate that a didactic student workbook has the potential to improve learning outcomes and interest in the learning of biology.

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Introduction

Didactic teaching materials facilitate the teaching and learning process (Morales, 2012; Hansen & Gissel, 2017). Didactic teaching materials consist primarily of questions that require various kinds of activities to answer (Hansen & Gissel, 2017). Didactic material has specific aims, student tasks, and measures for evaluation. For example, a workbook and textbook for a specific subject and grade level or a course for a specific topic within a course of study (Gissel & Buch, 2020), can significantly impact students' learning experiences. Didactic teaching materials are equipped with guides for students on how to study learning materials. Though the utilization of didactic teaching materials in learning

shows promise for improving learning outcomes, particularly when following established guidelines (Gissel & Buch, 2020; Fernández & León, 2016), more research is required to fully understand the complex dynamics and potential factors that may influence the efficacy of these materials in educational settings.

Human anatomy and human physiology are a compulsory subject in the biology education department of biology, the Faculty of Tarbiyah and Teacher Training, UIN Mahmud Yunus Batusangkar. For decades, textbooks have been the main medium for supporting the teaching and learning of human anatomy and physiology (Chruscik et al., 2022), and there are many good textbooks. Several textbooks provide detailed descriptions of human anatomy (Paulsen et al., 2019), while some focus on realistic illustrations (Thompson, 2015). Detailed and simplified illustrations textbook of human anatomy have been shown to not correlate significantly with learning outcomes because they may not effectively engage students or help them relate the content of the material to their experiences (Lin et al., 2017). This causes a gap between the real life of students and the content of textbooks, thus becoming the main cause of failure of educational institutions in general (Tidon & Lewontin, 2004).

Lieu et al.(2018) and Chruscik et al., (2022) state that textbooks have been the main medium for supporting knowledge of human anatomy and physiology. But often the purpose and effect of educational content in the textbooks used are far from the expectations and interests of learners, leading to student learning difficulties and learning outcomes consequently not match expectations (Chruscik et al., 2022). Almazova, Barinova & Ipatov, (2018) state that students responded very positively to didactic teaching resources in the form of moving picture objects. One alternative is the use of didactic workbooks containing many activities as supplements to textbooks (Marneli, Delfita and Pratama., 2022), including contemplative practice, colouring, completing, contextualising in colour, crosswords, connecting, summarizing a picture, describing processes, sequencing a variety of illustrations and writing the results of contemplation activities. This activity is didactic and supports all learning styles of all leaners (Marneli, Delfita and Pratama., 2022).

Cardoso, Cristiano and Arent, (2009), dos Santos, FS, Guimarães, (2017) and Delfita *et al*.(2020) investigated the effectiveness of didactic teaching materials in increasing student engagement and improving learning outcomes. The teaching materials they used were limited to construct their understanding through drawings and contemplative activities. However, the extent to which didactic teaching materials influence learning and student responses to didactic teaching materials has not been clearly described. This research focuses on learning outcomes and students' learning responses after using didactic workbooks in human anatomy and physiology in undergraduate biology education.

Conceptual Framework of Study

Didactic Teaching Material

Morales (2012) states didactic teaching materials are a group of instructional tools that support the teaching and learning process. According to Fernández & León, (2016), didactic teaching materials include all tools for facilitating the teaching and learning process methodically in an educational setting, as well as for stimulating the senses to aid in the acquisition of ideas, aptitudes, and skills and the development of attitudes and values. dos Santos & Guimarães (2017), Effiong & Igiri (2015), and Stanisavljević et al., (2016) define didactic teaching materials as all tools that help students in contextualising knowledge, filling gaps during learning, facilitate them constructing their scientific knowledge concepts independently, help connect previous knowledge with new knowledge, and develop higher order thinking skills. The authors make it clear that the goal of didactic teaching materials is to facilitate, create, and provide meaning to explanations in order to guide students toward learning, as well as the construction of attitudes and values. This concept captures the overarching goal of education, which is to change society for the better via education. According to

Krista et al., (2016), Chowdhury & Rankhumise, (2022) and Azizah & Nasrudin (2021), the quality of the teaching materials and the use of efficient learning techniques have a direct impact on students' academic achievement.

Didactic teaching resources can be found in a variety of places, including textbooks, websites, and materials created by the teacher. These educational resources include worksheets, workbooks, games, posters, flashcards, and more. Workbook with various pictures are an example of instructional material (Fernández & León, 2016). The teacher gives the students a picture and instructs them to utilise the image to communicate the personal learning objectives. An approach in which a teacher presents pictures to students and asks them to use the pictures as a tool to communicate personal learning goals is a powerful strategy in didactic teaching contexts. Teachers help students to think critically, develop analytical abilities, and connect the material they learn to past experiences and knowledge by allowing them to evaluate visuals and apply them to the topics being studied. This not only improves students' comprehension of the subject, but it also promotes their involvement in the learning process and builds their emotional connection to the information. Thus, using visuals as a communication medium in didactic learning can enhance students' learning experiences and aid in the successful achievement of learning objectives.

Educators generate didactic materials to provide context to their explanations or when they ask their students to do so as part of an activity. The didactic teaching materials packaged in workbook form developed by Marneli, Delfita and Pratama (2022), has questions that require completion with a variety of activities including contemplative practice, colouring, completing, contextualising in colour, crosswords, connecting, summarizing a picture, describing processes, sequencing a variety of illustrations and writing the results of contemplation activities. This activity is didactic and supports all learning styles of all leaners. Beside site, contemplation activities make thinking deep and all-encompassing (Song and Muschert, 2014).

According to Sablić et al. (2015), specifications for didactic teaching materials include several important points. *First*, creating educational materials is not difficult, costly, or excessively time-consuming. Efficiency in creating materials is important for educators to easily access and use them. *Secondly*, effective pedagogical content must be clear, simple, and meaningful for students, ensuring a good understanding of the material presented. *Thirdly*, didactic material must contain information that is valuable, needed, and helpful in the learning process. *Fourthly*, the material must be able to stimulate student interest and motivation, which is an important factor in increasing engagement and desire to learn. *Fifthly*, it is important to ensure that students not only study seriously but also enjoy the material presented. *Finally*, flexibility in educational materials allows for necessary editing to suit learning needs without significant barriers.

Fernández & León (2016) likewise describe several essential qualities of didactic teaching materials. *First*, these materials must be effective, employing diverse examples and engaging activities to convey information. Students should feel comfortable, confident, and personally connected to the subject matter, emphasising its relevance and usefulness to them. *Secondly*, didactic teaching materials should encourage and require independent learning, fostering self-reliance and autonomy among students. *Thirdly*, accommodating various learning styles is crucial, ensuring that all students can effectively engage with the materials. *Fourth*, these materials should stimulate intellectual, artistic, and emotional involvement, triggering both left and right brain activity to enhance learning capacity. *Fifth*, they should not only aid in achieving learning objectives but also nurture positive attitudes and values. For instances, collaborative learning, whether individually, in pairs, or in teams, cultivates a supportive environment where students help each other, work together to accomplish goals, and develop positive attitudes. Additionally, didactic materials play a role in cultivating higher-order thinking abilities, such as problem-solving skills. Explicitness is another essential characteristic, ensuring clarity and transparency in the material's content. *Lastly*, customization and relevance to student specific needs are crucial to effective didactic teaching materials, tailoring the content to resonate with the learner experiences and requirements.

The use of didactic teaching materials promotes students' learning activity and independence (Fernández & León, 2016), helps learners to understand abstract terms in concrete terms, and enhances the integration between cognitive processes and physical manipulation (Politi, 2023). Rosli et al. (2015) note that students who are provided with a stimulating environment rich in preparatory resources, practical teaching methods in mathematics, and a diverse array of materials for reading and writing practice tend to demonstrate better learning outcomes and exhibit higher levels of intrinsic motivation compared to their counterparts exposed solely to traditional teaching methods. Many studies show that the use of didactic teaching materials encourage students' motivation to learn, interest in learning, their independence and other positive attitudes higher when compared to the use of other teaching materials (Milinković & Bogavac, 2011, Utami et al., 2020, Diaz & Woolley, 2015; Tursunovich, 2022).

Construction of Didactic Workbook

A workbook is a book that contains exercises and questions for students and typically includes spaces for their replies. Workbook activities must be in line with the lesson and be directly related to the main content. Using a workbook, teachers may assess their students' learning progress and use the results to decide how best to assist the students moving forward. Workbooks are an excellent teacher's first tool when introducing ways for increasing student enjoyment of learning (Utami et al., 2020).

In this study, "workbook" refers to a book containing exercises and questions designed to facilitate the student learning process in human anatomy and physiology. A workbook contains a variety of tasks that require a variety of student activities including contemplative practice, colouring, completing, contextualising in colour, crosswords, connecting, summarizing a picture, describing processes, sequencing a variety of illustrations and writing the results of contemplation activities (Figure 1). This activity is didactic and supports all learning styles of all leaners.

The didactic workbook also guides students in getting to know verses from the al-Qur'an and *asma al husna* (the best names are based on the characteristics of God) contained in the material. The contemplative element of the teaching materials developed is the existence of contemplative activities that make students directly connected to God and the material at the same time. Material is used as an object of contemplation and (the best names are based on the characteristics of God) is instilled in students during contemplation activities (Marneli, Delfita and Pratama, 2022). Contemplation activities that make the subject matter the object of contemplation make thinking deep and all-encompassing (Song, and Muschert, 2014; Delfita et al., 2020). In conjunction with contemplation, it can promote spirituality as well as self-awareness and compassion (Davidson et al., 2012; Zajonc, 2013; Delfita et al., 2020), boost attention, stimulate the work of the left and right brains (Jha, Krompinger, & Baime, 2007), and enhance metacognitive skills (Zeidan et al., 2010).

This didactic workbook was designed using the ADDIE model (analysis, design, development, implementation, evaluation (Molenda, 2003). In the process of designing didactic workbook is based on reality in the field. Considerations at the analysis stage include the curriculum, competency standards and basic competencies in the human physiological anatomy course, problems found in learning human anatomy and physiology, and student characteristics. The construction of this didactic workbook is grounded in educational and developmental research design (Richey, Klein, & Nelson, 2002). Furthermore, this research adheres to additional criteria; it has undergone a comprehensive process spanning from design activities to assessment and revision. Consequently, the workbook has been developed with logical consistency, aligning expectations with reality (Nieveen, 2007). Formative evaluation was carried out to assess the validity of the workbook developed. Didactic workbooks are designed to bridge the gap between materials and students during learning.

Figure 1

Didactic student workbook

Note. (Marneli, Delfita and Pratama, 2022) Example of didactic workbook constructions. a = cover; b = outline of material and didactic activities for chapter 11 of the respiratory system material; c = introduction to the respiratory system material; d = workbook 11A, activity of completing verses that are scientific signs of the respiratory system; e = workbook 11E, activity of arranging words correctly and then connecting them with lines according to the characteristics of the words that have been arranged, workbook 11F = activity of choosing the right words; f = workbook 11G, conceptualization activity through colouring pictures and finding the *asma al husna* in the picture; g, h and i = contemplation activity.

The feasibility of didactic workbooks is assessed from their validity and practicality. Validity is assessed from the results of expert validator assessments and practicality refers to a systematic evaluation process that focuses on the practical aspects of using these materials in real-world teaching and learning environments biology education students. The validity of the didactic workbook has a value of 3.45 ± 0.43 on a 4-point scale (with 3.20 being 'very valid'), indicating a high level of validity. Similarly, its practicality is rated at 3.32 ± 0.43 on the same scale (with 3.20 being 'very practical'), signifying a high degree of practicality (Marneli, Delfita and Pratama, 2022).

Methods

Research Design

The didactic workbook was trialled on students enrolled in human anatomy and physiology courses during their sixth semester of the Biology study program. Three meetings comprise the online learning process. The respiratory, digestive, and urinary systems' anatomy and physiology are covered in the course content. Before instruction began in the experimental class, students were given the didactic workbook and instructed to complete the assignments in it outside of class. The ensuing assignment was handed in before the lesson started. The discussion method is a learning method that exposes students to a problem. The main purpose of this method is to solve problems, answer questions and understand students' knowledge, and to make decisions. Discussions are more about exchanging experiences to determine certain decisions together. The problems discussed are problems in the workbook. In the control class, students were given a textbook and instructed to create a résumé and answered the questions the textbook. The control class also use the discussion method. A pre-test and a post-test were administered in both classrooms at the beginning and end of each lesson. Additionally, both courses discussed the survey responses from the students. Pre-test and post-test are compared after analysis.

Table 1

Research design

Groups	Pre-test	Treatment	Post-test
Experiment Class	O_1	x	O_2
Control Class	O_3	-	O_4

Note. O_1, O_3 = pre-test; O_2, O_4 = post-test; x = treatment using didactic workbook.

Participants

The participants of this study were biology education students of UIN Mahmud Yunus Batusangkar in the sixth semester of the 2021-2022 academic year. There were 31 students (18 local A students were selected as the experimental class, and 13 local B students were selected as the control class). The experimental class consisted of 16 women and 2 men, while the control class consisted of 13 women. Three meetings were held between biology education students of UIN Mahmud Yunus Batusangkar to evaluate the learning outcome of didactic teaching materials. Responses of students after using the didactic workbook in their learning process were also measured. The student response criteria that are measured are acceptance of teaching materials (satisfaction, awareness, perception, appreciation of teaching materials), learning interest after learning using teaching materials, advantages of teaching materials, and effective in encouraging student interaction.

Instruments of Research

Essay questions (pre-test and post-test) and student response questionnaires about the use of didactic workbooks were used as research instruments. Before implementation, the instruments underwent validation by three validators, an expert in learning evaluation and educational technology. Following validation, it was determined that 8 essay questions for each material to be tested were valid. Additionally, 35 response questionnaire items were declared valid based on the validation results. Instruments that passed validation were then implemented in limited trials in other classes, specifically among Biology Education Students, UIN Mahmud Yunus Batusangkar in the Sixth Semester, Class C. The results of the essay tests were analyzed for the question items, resulting in the identification of five questions that could be effectively used for each material. The questionnaire responses regarding the use of teaching materials also were analyzed, resulting in the identification of 33 questionnaire statement that could be effectively used for this study. The pre-test and post-test questions relate to the anatomy and physiology of the respiratory, digestive, and urinary systems. The response questionnaire regarding the use of teaching materials includes student appraisal of teaching materials (satisfaction, perception, and appreciation), student interest, the usefulness of didactic workbooks, and the effectiveness of didactic workbooks in encouraging interaction between students. Only the experimental class was tested for its response to the use of didactic teaching materials. The pre-test and post-test questions used are as follows:

The respiratory system:

Q1 Write the names of the letters and verses in the Qur'an that explain the respiratory system and give an explanation!

Q2 Explain the main role of each part of the human respiratory system (e.g., trachea, bronchi, alveoli) in the process of gas exchange. Include *asma al husna* as seen in each role of each part of the respiratory system!

Q3 Explain the difference between the processes of inspiration and expiration in the human respiratory mechanism. Include the role of the diaphragm and intercostal muscles in both processes!

Q4 Describe the process of gas exchange that occurs in the alveoli of the human lungs. Explain how oxygen and carbon dioxide are transferred between the air in the alveoli and the capillary blood!

Q5 Explain the symptoms, causes, and treatment of one of the common respiratory diseases, such as pneumonia. Include ways of transmission and prevention efforts!

The digestive system:

Q1 Write the names of the letters and verses in the Qur'an that explain the digestive system and give an explanation!

Q2 Explain the main role of each part of the human digestive system. Include *asma al husna* as seen in each role of each part of the digestive system!

Q3 Describe the process of digestion of human food from the mouth to the small intestine, including the role of the enzymes involved in each stage!

Q4 Explain the process of fat digestion in the human small intestine!

Q5 Explain the symptoms, causes, and treatment of one common digestive disease!

The urinary system:

Q1 Write the names of the letters and verses in the Qur'an that explain the urinary system and give an explanation!

Q2 Explain the main role of each part of the human urinary system. Include *asma al husna* which is seen in each role of each part of the urinary system!

Q3 Describe in detail the process of urine formation from glomerular filtration to elimination as urine!

Q4 Explain the role of the kidneys in the regulation of blood pressure and electrolyte

balance in the human body!

Q5 Explain the symptoms, causes, and treatment of one of the common diseases related to the urinary system!

Data Analysis

The *t* test was used to assess the difference between the increase in learning outcomes before and after treatment in the experimental group and control group. The learning outcomes data was evaluated for normality and homogeneity before the *t* test. The N-Gain test was used to determine if the didactic workbook was effective at improving learning outcomes. N-Gain states the gain normality test value and % *ideal score* represents % maximum score.

N-Gain is determined using the formula used by Abdurrahman et al. (2019) and Hanifah et al. (2023). N-Gain formula is:

$$N - Gain = \frac{\%\ posttest\ score - \%\ pretest\ score}{\%\ ideal\ score - \%\ pretest\ score} \quad (1)$$

Table 2

The effectiveness of N-Gain scoring

Percentage (%)	Criteria
<40	Ineffective
45-55	Less effective
56-75	Quite effective
>76	Effective

Note. Hake, 1999

Table 2 shows effectiveness of N-Gain score on 100 scale (with <40 indicating ineffective, 45-55 indicating less effective, 56-75 indicating quite effective and >76 indicating effective.

To compare whether there is a significant difference in the level of effectiveness of increasing student learning outcomes in the experimental and control group, an independent *t*-test is performed on the N-Gain score.

Students response to the didactic workbook was assessed using following formula, which was adapted from (Muliyardi, 2006).

$$Average\ student\ response = \frac{Total\ score\ of\ student\ respons}{Total\ number\ of\ criteria} \quad (2)$$

Table 3

Student response category

Average level of response	Category
>3.20	Very positive
2.40-3.20	Positive
1.61-2.39	Quite positive
0.80-1.60	Negative
<0.80	Very negative

Findings

Learning Outcome and Effectiveness of Teaching Materials

Student learning outcomes in the experimental and control groups before and after learning in human anatomy and physiology courses can be seen in Table 4. In Table 4, it is known that student learning outcomes in human anatomy and physiology courses show significant improvements from before to after learning in both groups, both experimental and control, for all physiological systems studied (respiration, digestion and urination). The experimental group showed greater improvements in learning outcomes compared to the control group. This is indicated by the significant difference (p<0.05) in the average scores before and after learning between the two groups. It can be concluded that the learning method applied to the experimental group provided better learning outcomes compared to the control group in human anatomy and physiology courses.

Table 4

Student learning outcomes in the experimental and control groups before and after learning in human anatomy and physiology courses

Course	Experiment Group		Control Groups		Sig.
	Before	After	Before	After	
Respiratory system	62.38 ± 8.63	79.33 ± 3.03	57.38 ± 11.56	67.84 ± 7.25	0.00
Digestive System	60.89 ± 9.92	79.33 ± 2.49	52.46 ± 9.39	64.69 ± 7.79	0.00
Urinary System	63.44 ± 10.14	79.94 ± 4.03	59.23 ± 8.25	68.92 ± 5.59	0.00
Mean ± SD	62.24 ± 9.56	79.53 ± 3.19	56.36 ± 9.73	67.15 ± 6.87	0.00

Note: The "Sig." column indicates that all differences between the experimental and control groups are statistically significant at level of 0.05.

To assess the effectiveness of using didactic workbooks in improving learning outcomes, the N-Gain formula is used. N-Gain is the difference between the scores before and after using the didactic workbook.

Table 5

The mean of N-Gain scores of experimental and control classes

Group	N-Gain Score (%)	Minimum N-Gain Score (%)	Maximum N-Gain Score (%)
Experiment	43.61	10.00	65.63
Control	22.88	-25.00	50.94

Note. N<40 is an ineffective category; 40-55 categories less effective; 56-75 categories are quite effective; >76 effective.

Table 5 indicates that the experimental group, which utilized the didactic workbook, achieved an N-Gain score of 43.61%, reflecting a higher effectiveness compared to the control group. Conversely, the control group attained an N-Gain score of 22.88%, indicating less effectiveness in comparison. Thus, it is known that there are differences in the effectiveness of increasing learning outcomes between the experimental class and the control class.

To compare whether there is a significant difference in the level of effectiveness of increasing student learning outcomes in the experimental group, an independent t-test is performed on the N-Gain score. Based on the independent t-test, it is known that Sig. 0.00<0.05. These data indicate that there is a significant difference (p<0.05) between learning outcomes of the experimental group

compared to the control group. In other words, using didactic workbook significantly improves learning outcomes compared to resume and answer questions in the textbook. Didactic workbooks provide a more structured, logically sequenced learning framework, contain questions that require completion with a variety of activities and support all student learning styles compared to practice questions in textbooks, thereby helping students to understand the concepts of the material progressively, reducing cognitive load, facilitate better understanding and promote critical thinking. When students are given assignments or exercises that suit their learning style, they tend to be more motivated and engaged in the learning process. This is because the assignments better suit the individual's preferences and strengths, thereby increasing their confidence and interest in learning the material.

The learning outcomes using the task of working on a didactic workbook with a discussion were effective than the learning outcomes using the task of resuming and answering textbook practice questions with a discussion, also due to the existence of collaborative activities in solving problems in the workbook. Collaboration between students in problem solving will allow them to think critically and deeply about the subject matter, which can increase their understanding. Active participation in learning is shown to improve comprehension and retention of knowledge.

Students Response to Didactic Teaching Material

Students responses to didactic workbook were evaluated in terms of their acceptance of the materials, their interest in them after utilising them, their usefulness in enhancing learning outcomes, and their effectiveness in promoting student engagement. The results showed that students responded very positively (3.32 ± 0.43) to the workbooks used in learning (Table 6). So, it is well known that workbooks are used in very effective ways by students to learn.

Table 6

Students response to didactic workbook

No	Assessment Aspect	Mean ± SD	Category
A.	Acceptance of teaching materials		
	a. Satisfaction	3.37 ± 0.51	Very positive
	b. Awareness, perception	3.32 ± 0.52	Very positive
	c. Appreciation of teaching materials	3.35 ± 0.51	Very positive
	Average	3.35 ± 0.51	Very positive
B.	Learning interest after learning using teaching materials	3.4 ± 0.46	Very positive
C.	Advantages of teaching materials	3.22 ± 0.39	Very positive
D.	Effective in encouraging student interaction	3.32 ± 0.36	Very positive
	Average	3.32 ± 0.43	Very positive

Discussion

Learning Outcome and Effectiveness of Teaching Materials

This research focused on investigating learning outcomes and students' responses to a didactic workbook. A didactic workbook has questions that require completion with a variety of activities including contemplative practice, colouring, completing, contextualising in colour, crosswords,

connecting, summarizing a picture, describing processes, sequencing a variety of illustrations and writing the results of contemplation activities. The research results show that didactic workbooks significantly improved student learning outcomes on this occasion (Table 4 and 5). Student responses to didactic teaching materials were very positive (Table 6).

This didactic workbook is able to improve student learning outcomes because it has a more organized, logically sequenced learning framework, contain questions that must be answered with a variety of activities, and support all student learning styles compared to practice questions in textbooks. These features help students comprehend the material more thoroughly, lessen cognitive load, facilitate better understanding, and encourage critical thinking (Mayer, 2002). Students are more likely to be motivated and involved in the learning process when they get tasks or exercises that are appropriate for their preferred learning style. This is because the assignments are more tailored to each person's interests and preferences, which boosts their confidence and piques their curiosity about the subject matter (Li et al., 2019; Lu et al., 2007). The learning outcomes using the task of working on a didactic workbook with a discussion were better than the learning outcomes using the task of resuming and answering textbook practice questions with a discussion, also due to the existence of collaborative activities in solving problems in the workbook. Collaboration between students in problem solving will allow them to think critically and deeply about the subject matter, which can increase their understanding (Johnson et al., 2014; Sweller, 2011). Active participation in learning is shown to improve comprehension and retention of knowledge (Prince, 2004).

The activities carried out in completing this workbook require students to be able to build their own knowledge, according to their learning style. Pashler et al., (2009) stated that students are more likely to participate actively in the learning process when the activities are tailored to their preferred learning styles. Their motivation and focus are maintained by this interaction, which improves their memory and comprehension of the subject matter. Colouring, summarising and writing activities provide good opportunities particularly for individuals with a kinaesthetic learning style because students with a kinaesthetic learning style do more physical activity. Students with a kinaesthetic learning style do more physical activity (Ariastuti & Wahyudin, 2022).

Interactive components like simulations and practical exercises are frequently included in didactic materials. By drawing students in and encouraging active engagement, these interactive elements enhance and stimulate the learning process (Sablić et al., 2015). Students are more motivated to engage with the information when it is connected to real-world situations, current events, or actual use. This helps students recognize the value and importance of what they are studying (Fernández & León, 2016; Delfita & Andrizal, 2016). Didactic materials often encourage active learning strategies such as problem-solving, critical thinking, and collaboration. These activities require students to be actively involved in constructing their own understanding of the material, which not only deepens learning but also increases motivation and engagement (Marneli et al., 2022). Students are more likely to feel encouraged and supported in their learning process when they come across engaging and stimulating resources. Good learning experiences promote self-efficacy and confidence, which boosts motivation and makes one more likely to persevere in the face of difficulties Akkuş and Doymuş, 2022). Besides that, contemplation activities that make the subject matter the object of contemplation make thinking deep and all-encompassing (Delfita et al., 2020; Song, & Muschert, 2014).

The availability of contemplative activities that make a subject an object of contemplation in the didactic workbook teaches students to focus their attention on a particular topic while also establishing a connection *asma al-husna* (the best names are based on the characteristics of God such as well meaning and kindly). According to Song and Muschert (2014), thinking becomes profound and all-encompassing when one is in a contemplative. In conjunction with contemplation, it can promote spirituality as well as self-awareness and compassion (Davidson et al., 2012; Zajonc, 2013; Delfita et al., 2020), boost attention, stimulates the work of the left and right brains (Jha, Krompinger, & Baime, 2007), and enhance metacognitive skills (Zeidan et al., 2010). According to critical thinking specialists (Kuhn, 2000; Nelson dan Rey, 2000), the practice of contemplation in the classroom promotes students

to learn, question presumptions, and build metacognitive skills both individually and collaboratively. Therefore, didactic workbooks can improve student learning outcomes.

The use of didactic teaching materials to improve learning outcomes has been reported by Cardoso, Cristiano and Arent, (2009), dos Santos, FS, Guimarães, (2017) and Delfita *et al*. (2020). These three studies did not assess the efficiency of didactic teaching materials (didactic workbooks). In this study, we investigated the efficacy of utilizing didactic workbooks, and the results showed that using didactic workbooks increased learning outcomes when compared to courses that did not use them. The findings demonstrate that using didactic workbooks improves students' learning since they can serve as a source of knowledge in addition to the teacher's explanations. Cardona and Mendez's (2018) research supports the conclusions of this investigation. Their research has shown that using didactic teaching materials can increase student learning outcomes in English learning.

Students Response to Didactic Teaching Material

The student response to the workbook was very positive (3.32 ± 0.43 (Table 6). It motivats them to become involved in the activities prescribed. Their acceptance of this teaching material is because this teaching material has its own charm, is easy to understand, and stimulates them to learn. Sablić et al., (2015) stated that teaching materials would be well received by students if they were attractive and stimulated them to learn. When they find valuable and useful teaching materials, they will accept them and show readiness to introduce them in their regular teaching. Didactic materials meet all of the demands of students while taking into account their preferred learning methods (Khasanovna, 2021). They also help students reach their full learning potential and develop higher-order thinking skills (Fernández & León, 2016). By connecting the existing learning materials in teaching materials with *asma al-husna*, contemplation exercises encourage the development of universal values and make teaching materials more relevant. The existence of contemplation activities by linking the existing learning materials in teaching materials with *asma al-husna* also increases spirituality (Delfita dan Andrizal, 2016; Delfita et al., 2020), train concentration, develop argumentation skills and metacognitive abilities individually and interactively (Zajonc, 2013). Effiong dan Igiri, (2015) state that teaching materials that can meet and answer the needs of students will be liked and responded to very well by students. Delfita et al., (2020) state that didactic and contemplative-based teaching materials require student cooperation to complete assignments in teaching materials.

This research is in line with that of Cardona and Mendez, (2018), who found that students responded very well to didactic teaching materials and improving their writing skills as a result. This research responded students very positively and improved their understanding of human anatomy and physiology especially on respiratory system material, digestive system and urinary system. However, student responses to the use of didactic workbooks that have a variety of activities to complete and cater to all students learning styles in the study of human anatomy and physiology, have recently been the subject of reports on student responses.

Conclusion and Implications

It can be concluded from the findings and discussion above that the didactic workbook was effective in improving learning outcomes and very positive received by students. Teachers can use didactic workbook to facilitate students for active learning because the use of workbooks will lead them to self-study. They can also use didactic workbook as supplementary material whose contents can be discussed in class with them.

Research Limitations

Although the results of this study show that didactic workbooks can improve learning outcomes and that students respond positively to their use, several limitations must be acknowledged. First, the sample size for the study was very limited, namely only 31 students in Biology Education, which may not represent the larger student population or different student groups. Second, research is limited to three teaching materials, namely the anatomy and physiology of the respiratory system, digestive system, and urinary system. Third, researchers had little control over whether there were distractions from the environment around students, such as sounds in the surrounding environment, which could reduce focus and discipline in discussions, because these studies conducted online using Zoom meetings. Finally, monitoring engagement and understanding the material are difficult. It can be difficult to assess students' engagement and comprehension in online discussions. Online, participants may struggle to accurately demonstrate their understanding or engagement. Because of these limitations, more research is needed to confirm the use of face-to-face didactic workbooks in the classroom.

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Conflicts of Interest

No conflict of interest.

Ethical Statement

When this research was conducted, UIN Mahmud Yunus Batusangkar did not have specific protocols for this type of study. Nonetheless, the participants were informed that their data would be used solely for research purposes and that they would be unable to be identified in any publications resulting from the study.

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