ISSN 2959-6149

The report of a teaching guide of 20.1 Magnetic effect of a current in IGCSE physics book for multidisciplinary physics teachers

SZE MAN LIN

Zhongshan Huachen Experimental Secondary School, Guangdong (528415), China, lsm080410@qq.com

Abstract:

Finding a more efficient way for teaching has been a key goal for multi-disciplinary physics teachers, as it could significantly improve students' conceptual understanding, enhance their examination performance, and build a stronger foundation for advanced physics topics. The present study intends to develop such a teaching guide by first identifying the core knowledge and examination priorities through a close reading of IGCSE textbooks and recent past papers. I focus on collecting and reviewing articles on teaching and learning principles to uncover truly efficient instructional strategies. Following this, I analyze several IGCSE syllabuses, teacher guides, and available resources to understand the required structure and content of an effective teaching guide. To capture learner perspectives, I design a survey for students who have completed the IGCSE physics examination , identifying the most difficult parts of section 4.5.3 (Magnetic effect of a current) and the teaching approaches they prefer. I also interview physics teachers at our school to learn how they design their lessons and how many class periods they allocate to this chapter. Finally, I analyze all collected data and synthesize the findings into a practical teaching guide for section 4.5.3.

Keywords: physics, electromagnetic, multi-disciplinary, teaching guide, Visual explanation and simulation, Step-by-step explanation, Group work, Video experiment

1. Introduction

Recent research shows that there is an increasing shortage of teachers in professional physics. Cookson (2025) reports that approximately 60% of Physics GCSE lessons are currently delivered by teachers who have not studied physics beyond the age of 18. Similarly, the Institute of Physics (2025) highlights

ISSN 2959-6149

that a significant proportion of English state schools lack specialist physics teachers entirely.

Given this context, there is an urgent need to provide structured and research-based guidance to support multidisciplinary or non-specialist teachers in delivering effective physics instruction. Many of these teachers possess strong teaching skills but may lack deep subject-specific confidence when teaching abstract concepts such as electromagnetism.

This report introduces the theoretical basis,research methods and teaching principles of Chapter 20.1 "Magnetic Effect of Current" in the IGCSE physics textbook. The purpose of this guide is to support multidisciplinary physics teachers in designing structured, engaging, and conceptually clear courses based on existing educational research findings.

2. Literature Review

2.1 Teaching theories

2.1.1 Backward Design (BWD approach)

Backward Design emphasizes planning instruction by first identifying desired learning outcomes, then determining appropriate assessment evidence, and finally designing learning activities (Lemov, 2010). Teachers do not start from activities but from questions, including that by the end of the course, what should students understand and what can they do? Rinaldi et al. (2025) suggest that learner-centred BWD approaches increase student engagement and skill mastery. This framework is particularly valuable for multi-disciplinary teachers as it provides a clear structural roadmap, reducing the uncertainty when teachers are not familiar with the content.

However, although BWD enhances clarity and coherence, it must be implemented flexibly to avoid overly rigid course structures that limit responses to students' misunderstandings.

2.1.2 Systematic Explicit Instruction

Martínez et al. (2010) conceptualise effective and explicit instruction as the provision of structured instructional supports or scaffolds that guide student learning. Similarly, Chen and Kalyuga (2020) argue that explicit instruction followed by problem-solving activities is consistently superior within the framework of Cognitive Load Theory. In conclusion,these findings all demonstrate the importance of well-organized guidance, especially when learners are dealing with complex content.

When confronted with abstract physical concepts like magnetic fields, systematic and clear explanations can help students grasp the basics before dealing with more difficult problems, thereby avoiding cognitive overload. However, an overly teacher-centered teaching approach may restrict students from asking questions and exploring deeper issues. Therefore, this teaching guide combines clear and structured discussions aimed at clarifying these concepts while promoting students' participation in the class.

2.1.3 Contextual Teaching and Learning (CTL)

The findings of this study confirm that the integration of the CTL model with the gamified platform Quizizz significantly improves students' physics learning outcomes (Humairah, N. A. et al., 2025). In addition, evidence shows that the results of the meta-analysis revealed an overall ES of 0.970 under the random effects model, indicating a significant positive impact of context-based learning on academic achievement (Tutal, Ö., 2023).

When teaching electromagnetism, real-world applications are particularly beneficial because students often find it difficult to visualize abstract field concepts. However, the examples in the context must be carefully selected to ensure the accuracy of the concepts rather than superficial engagement.

2.2 Problems Teachers Often Meet

A common problem in physics classes is that students have a weak memory ability for prerequisite knowledge, which leads to an unreasonable class pace. Anita L et al. (2010), Ayodele Abosede Ogegbo, Umesh Ramnarain(2022), and Ahn, D., & Chan, J. C. K. (2025) highlight the importance of retrieval practice in strengthening new learning.

However, excessive pre-teaching or overly detailed preparation materials may cultivate students' dependence and limit their ability to independently activate existing knowledge.

When students encounter unresolved misunderstandings, another challenge emerges. Some teachers address this through structured summarisation and guided group discussion, an approach reflected in Robert’s (2007) practice of segmenting instruction to allow reflection and peer exchange. While collaborative strategies can clarify misconceptions, unequal participation may reduce their effectiveness. Therefore, structured accountability within group work is essential to ensure active engagement.

2.3 The meaning of the teaching guide

Cookson, T. (2025) shows that some 60% of Physics GCSE lessons are now taken by teachers who have not studied a Physics-related subject beyond the age of 18. Furthermore, the Institute of Physics (IOP) (2025) agrees that a quarter of English state schools now have no specialist physics teachers at all. In contemporary society, there are few teaching guides that provide enough detail to guide interdisciplinary physical teachers on how to design a highly efficient lesson. Therefore, the teaching guide designed is meaningful to promote the quality of education.

3. Methodology

3.1 Literature Research

A comprehensive review of peer-reviewed educational research (2010–2026) was conducted to identify evidence-based instructional strategies relevant to physics education. Sources included academic journals, teacher guides, IGCSE syllabi, and examination materials.

The literature informed the selection of teaching approaches such as multimedia integration, retrieval practice, structured discussion, and contextual examples.

3.2 Questionnaire

Table 1. The questionnaire

Questions	Option	Frequency	Percentage(%)
1、How old are you?	15 to 16 years old	179	78.51
	16 to 18 years old	37	16.23
	Other (please specify)	12	5.26
2、How would you rate your interest in this topic? (1=Not interest，6=Fully interest)	1.0	10	4.39
	2.0	12	5.26
	3.0	35	15.35
	4.0	65	28.51
	5.0	69	30.26
	6.0	37	16.23
3、What's your IGCSE physics examination level?	A star	79	34.65
	A	85	37.28
	B	58	25.44
	others	6	2.63
Total		228	100.0

A questionnaire was distributed via the Wenjuanxing platform to students who had studied IGCSE Physics. The survey consists of 14 questions and its aim is to investigate students' learning preferences, the main difficulties they encounter and the teaching methods they are eager to improve.

After data cleaning, 228 valid responses were obtained.

Key Findings:

① 60.96% preferred real-life examples when introducing new concepts.

② 58.77% preferred demonstration experiments or videos.

③ 57.89% requested more step-by-step solved examples.

④ The lowest average understanding (4.36/6) was reported for relay applications.

⑤ 52.19% struggled with linking theory to real-life applications.

These findings align with existing literature emphasizing contextual learning and structured explanation.

3.3 Interview

Two experienced physics teachers, with over 10 and 15 years of teaching experience respectively, participated in semi-structured interviews.

Thematic Findings:

① One of them emphasized reviewing prior knowledge before introducing new content.

② Both used simulation animations and experiment videos for abstract topics.

③ Both relied heavily on past examination questions for assessment.

④ Both highlighted the importance of structured learning guides.

The interviews confirm that the strategies identified in the

ISSN 2959-6149

literature are also applied in professional settings.

4. Principles of teaching design

4.1 Preview assignment

The preview tasks in this teaching guide provide a clear structure to help students figure out the goals they need to learn, the main content, and the common difficulties they encounter. Based on the above guidance, students can solve some simple problems by reading textbooks and searching for relevant knowledge online, and then leave the more complex ones to be solved in class. This is conducive to making students listen carefully in class.

This design is supported by both research and practitioner insights. Studies show that structured pre-lecture preparation enhances learner autonomy, engagement, and academic success (Agrawal et al., 2025; Alfahaad et al., 2026) and that aligning activities with clear goals fosters genuine competence (Ambrose et al., 2010). Practitioner perspectives further reinforce this approach: one interviewed teacher reported developing learning guides to scaffold students' independent preparation.

4.2 Reviewing the previous knowledge

After teachers review relevant prerequisite knowledge, students are less likely to spend class time recalling basic concepts when addressing more complex problems. Evidence shows that engaging in content-relevant episodic retrieval can reliably enhance new learning (Ahn, D., & Chan, J. C. K., 2025). Consistent with this finding, one of the interviewed teachers reported that she intentionally revisits previously learned knowledge points to introduce new concepts and support students' understanding.

4.3 Lead in

Introducing new content through a real-world application video. The pedagogical value of this approach is well-documented. Dennis W. Sunal et al (2016) observed that real-world applications fostered greater student enjoyment in physics. Extending this, Zheng, Q., Tsong, C.K., and Wan Yahaya, W.A.J. (2025) demonstrated that scenario and video-based approaches enhance learning engagement, performance, and satisfaction. Moreover, Ahn, D., & Chan, J. C. K. (2025) found that engaging in content-relevant episodic retrieval can reliably enhance new learning. The rationality of these research is also recognized by the students. According to the results of the questionnaire, 60.96% of the respondents prefer to introduce a new concept by using real-life applications or interesting phenomena.

4.4 In class

4.4.1 .Visual explanation and simulation

Using diagrams to explain the Right-Hand Grip Rule and magnetic field lines helps students visualise field direction and compare field strength more clearly. Ogegbo, A.A., and Ramnarain, U. (2022) suggest that simulation models help students understand abstract scientific concepts. Consistent with this view, one interviewed teacher reported using simulation animations to explain difficult physics topics.

4.4.2 Video experiment

The video demonstrations of Oersted's experiment allow all students to clearly observe the phenomenon, overcoming visibility limitations in traditional classroom demonstrations. Compared with verbal explanation alone, videos also help students identify the relationship between the current and magnetic field strength. Educational videos with interactive features have been shown to significantly improve retention and comprehension (Ploetzner, R., 2024). One interviewed teacher similarly reported using experimental videos to explain abstract concepts.

4.4.3 Group work

After analyzing the pictures of these relays' applications in real life, students will have group discussions to define the errors in the picture. These cooperative behaviors will encourage students to explain to each other, clarify these concepts and promote their active participation in the class at the same time. Research suggests that social learning can be more effective than individual learning (Emmy Vrieling-Teunter, Rosanne Hebing, & Marjan Vermeulen, 2021).

4.4.4 Step-by-step explanation

For complex problems, step-by-step worked examples help students understand problem-solving procedures and strengthen conceptual understanding. Yultuz Omarbakiyeva et al. (2025) note that structured worked examples support cognitive processing during learning. Questionnaire results also indicate that 57.89% of students would like more step-by-step examples in physics lessons.

4.5 After-class practice

Homework consists primarily of past examination questions and textbook exercises to consolidate lesson content and familiarise students with exam formats. The CAIE (2023) syllabus emphasises practising past examination questions for effective assessment preparation. Similarly, one interviewed teacher reported organising assignments by chapter or knowledge point to comprehensively cover examinable content and evaluate students' understanding.

5. Test

5.1 The teaching process

After reading the teaching guide, three multidisciplinary teachers reported that they felt confident in completing the demonstration independently. They noted that the operational steps are clearly described, allowing them to understand what needs to be done at each stage, and that the required materials, particularly the use of video resources, are easy to obtain. The layout of the guide is also clear, which helps readers understand the content efficiently.

The experienced physics teacher also commented that the language of this teaching guidance is smooth and the structure is clear, making it particularly suitable for interdisciplinary teachers to use. The main advantage of this teaching guidance lies in the strong correlation between the images and the content. Meanwhile, this teaching guidance combines a question-and-answer session, group discussions and error analysis, which are conducive to students' in-depth thinking through mutual learning. However, this teacher also pointed out that this teaching guideline also requires the applying teacher to have a certain foundation in physics to facilitate its effectiveness.

5.2 Accuracy of professional knowledge

This experienced physics teacher gave the accuracy of the science a score of 8/10. He evaluated that the core content of this teaching guide was basically correct, but some terms were used inappropriately, especially the confusion between electric field and magnetic field. Moreover, the explanation of the partial principle of the electromagnetic relay is not rigorous enough. After receiving his feedback, these issues were corrected accordingly.

6. Evaluation

6.1 Highlights

This study adopted a combination of literature research and investigation methods. Among them, the investigation method was mainly carried out through questionnaires and interviews. 228 valid questionnaires were collected and two teachers were interviewed. By using these several methods, the obtained data can be mutually verified, enhancing the reliability of the conclusion.

6.2 Limitations

This study has several limitations. First of all, the fact that only two professional physics teachers were interviewed may limit the breadth of the viewpoints represented. Second, the teaching guide was developed exclusively for Chapter 20.1, limiting the generalisability of the design framework to other topics within the IGCSE Physics curriculum.

Future research could address these limitations by expanding the participant pool and incorporating a wider range of curriculum topics.

References

[1] Archer, A.L. and Hughes, C.A. (2010). Explicit Instruction: Effective and Efficient Teaching. [E-book] New York: Guilford Press. Available at: https://www.guilford.com/books/Explicit-Instruction/Archer-Hughes/9781609180416 (Accessed: 13 February 2026).

[2] Ambrose, S.A., Bridges, M.W., DiPietro, M., Lovett, M.C., and Norman, M.K. (2010). How Learning Works: Seven Research-Based Principles for Smart Teaching. [E-book] San Francisco: Jossey-Bass. Available at: https://www.wiley.com/en-us/How+Learning+Works%3A+Seven+Research-Based+Principles+for+Smart+Teaching-p-9780470484108 (Accessed: 13 February 2026).

[3] Ahn, D., & Chan, J. C. K. (2025). Interpolated Retrieval of Relevant Material, Not Irrelevant Material, Enhances New Learning of a Video Lecture In-Person and Online. Behavioral Sciences, 15(5), pp.16.

[4] Agrawal, P., Singhal, A., Banu, N., Saxena, A., Singh, S., Chandra, S., Shefali, I., and Srivastava, A. (2025). 'Pre-Lecture Lesson Plans and Learning: insights from Undergraduate Medical Students (PLP-UMS)', BMC Medical Education, 25(1), pp. 7.

[5] Chen, O. and Kalyuga, S. (2020) 'Exploring factors influencing the effectiveness of explicit instruction first and problem-solving first approaches', European Journal of Psychology of Education, 35(3), pp.2.

[6] CAIE (2023) Teacher guide: Cambridge IGCSE / Cambridge IGCSE (9-1) Physics 0625 / 0972, Scribd. Available at: https://www.scribd.com/document/554474504/0625-Teacher-Guide-for-examination-from-2023 (Accessed: 13 February 2026).

[7] Cookson, T. (2025). Teaching Physics Without Physicists. physicspartners[online]Available at: https://physicspartners.com/teaching-physics-without-physicists[Accessed: 24 February 2026].

[8] Esquembre, F., Zamarro Minguell, J.M., Amorós Poveda, L., Martínez, F. and Fernández, L.M.ª (2010). Teacher Guide and Seminar: Experience in Physics Education. Latin-American Journal of Physics Education, 4(1), 174-180. page 117.

[9] Humairah, N. A. et al (2025) 'Analysis of the Impact of Contextual Teaching and Learning Integrated with Quizizz on High School Students' Learning Outcomes', Jurnal Pendidikan

ISSN 2959-6149

Fisika, 13(2), pp.255.
[10] Hamad A. Alfahaad et al (2026) ‘From Text to Test: Pre-Lecture Reading Boosts Medical Students‘ Comprehension and Retention’, Saudi Medical Journal, 47(1), pp. 114.
[11] Institute of Physics (IOP) (2025) More than half a million GCSE students to start new school year with no physics teacher. Press release, 2 September. Available at: https://www.iop.org/about/news/more-half-million-gcse-students-no-physics-teacher (Accessed: 25 February 2026).
[12] Lemov, D. (2010). Teach Like a Champion: 49 Techniques that Put Students on the Path to College. [E-book] San Francisco: Jossey-Bass. Available at: https://books.google.com/books?id=JJTfAwAAQBAJ (Accessed: 13 February 2026).
[13] Marzano, R.J. (2007). The Art and Science of Teaching: A Comprehensive Framework for Effective Instruction. [E-book] Alexandria, VA: ASCD. Available at: https://www.ascd.org/books/the-art-and-science-of-teaching (Accessed: 13 February 2026).
[14] Omarbakiyeva, Y.et al (2025)‘Relationship between the cognitive load and the learning success in applying force diagrams: eye-tracking study’, Frontiers in Education, 10, pp.1.
[15] Ogegbo, A.A. and Ramnarain, U. (2022). Teaching and learning Physics using interactive simulation: A guided inquiry practice. South African Journal of Education, 42(1), pp. 3-4.
[16] Ploetzner, R. (2024) ‘The effectiveness of enhanced interaction features in educational videos: a meta-analysis’, Interactive Learning Environments, 32(5), pp. 14.
[17] Rinaldi, K., Messer, M., Hanson, A. and Chan, J. (2025) 'Utilization of backward design in health professional education: A rapid review', Journal of Professional Nursing, 58, pp. 1.
[18] Tutal, Ö. (2023) 'Does Context-Based Learning Increase Academic Achievement and Learning Retention?: A Review Based on Meta-Analysis', Journal of Practical Studies in Education, 4(5), pp. 10.
[19] Vrieling-Teunter, E., Hebing, R., and Vermeulen, M. (2021). Design principles to support student learning in teacher learning groups. Teachers and Teaching. pp.1.
[20] Zheng, Q., Tsong, C.K., and Wan Yahaya, W.A.J. (2025) ‘Exploring the research landscape of scenario and video-based learning: A bibliometric and content analysis from 2018-2024’, International Journal of Innovative Research and Scientific Studies, 8(8), pp.286.

Appendix

Questionnaire Results:

Which learning resources did you use for this chapter? (Multiple choice allowed)

Option	Frequency	Percentage
Textbook	128	56.14%
Teacher’s notes	120	52.63%
Online videos or simulations	90	39.47%
Past papers and worksheets	103	45.18%
Group discussions	95	41.67%
Other (please specify)	2	0.88%
Valid Respondents	228	

What activities do you think will stimulate your interest in physics and let you concentrate on lessons?(multiple choices)

option	frequency	percentage
Prize quiz for a challenging question	114	50%
hand on-activities or do experiences	118	51.75%
watching some video about this physics principle’s life application	124	54.39%
Group working	107	46.93%
Others	5	2.19%
Valid Respondents	228	

Which method(s) do you prefer for teachers to introduce a new concept? (Multiple choice allowed)

Option	Frequency	Percentage
A real-life example or interesting phenomenon	139	60.96%
A demonstration experiment or video	134	58.77%
Direct explanation of the concept and formulas	105	46.05%
Posing a challenging question	110	48.25%
Valid Respondents	228	
		Total:18.39 Average: 4.6

How well do you understand the following concepts? (1=Not at all, 6=Fully understand)

Title	Average
Relationship between electric field strength and current	4.72
How to use the Right-Hand Grip Rule (or Right-Hand Rule) to determine magnetic field direction?	4.75
Analysis of the role of electromagnets in simple devices like relays and circuit breaker	4.36
Design of an electromagnet and methods to increase its magnetic field strength	4.56
	Total:18.39 Average: 4.6

What improvements would you expected to accept in physics lessons? (Multiple choice allowed)

Option	Frequency	Percentage
More interactive simulations	112	49.12%
Step-by-step solved examples	132	57.89%
Clearer real-world applications	123	53.95%
Additional practice problems	106	46.49%
More time for hand-on activities	109	47.81%
More time for group working	100	43.86%
Other (please specify)	4	1.75%
Valid Respondents	228	

To what extent do you believe the teacher's confidence in their own academic ability affects your efficiency and state of mind during physics lessons? (1=Not affect, 6=Very affect)
Average: 4.54

Option	Frequency	Percentage
1	5	2.19%
2	6	2.63%
3	24	10.53%
4	69	30.26%
5	74	32.46%
6	50	21.93%
Valid Respondents	228	

What difficulties did you face while studying this chapter?

ISSN 2959-6149

Option	Frequency	Percentage
Abstract concepts hard to visualize	111	48.68%
Mathematical calculations	84	36.84%
Linking theory to practical applications	119	52.19%
Memorizing definitions and rules	115	50.44%
Other (please specify)	6	2.63%

Questions of interview:

1. How long have you been teaching physics?
2. What is your typical approach to introducing a new concept or topic to students, and what is the thought process behind this choice?
3. What is your core guiding philosophy or primary goal when designing a physics course? Is it to cultivate scientific thinking, connect to the real world, or prepare for exams?
4. How do you decide the sequence of topics? Do you follow the textbook, progress by logical difficulty, or build around a central question?
5. How do you balance the time between theoretical instruction, formula derivation, and experimental inquiry or real-world application?
6. How do you design your assessments (homework, quizzes, projects)? How do you ensure they measure the abilities you value, not just memorization?
7. When facing an abstract and difficult topic (e.g., ‘electric fields’ or ‘quantum concepts’), what teaching strategies do you typically employ? Which one has been most effective?
8. What digital tools or technologies (e.g., simulation software, data loggers, video analysis) do you use to enhance learning? How have they changed your course design?
9. Through what specific means (e.g., student feedback, peer observation, performance analysis) do you collect information to iterate and improve your course design?
10. Do you incorporate lesson handouts or the textbook into your teaching? If so, at which specific stages or moments in the class do you typically use them?
11. Students have vastly different prior knowledge and interests. How do you address this in your design to support learners at different levels?
12. The answer of the first teaches:
13. 10 years.
14. Review relevant knowledge points that have been learned, or life-related applications.
15. Clarify the logic between knowledge points, cultivate logical thinking skills, and master exam points.
16. Mainly follow the order of the textbook.
17. Mainly follow the order of the textbook.
18. More often than not, it involves theoretical lectures or formula derivations. For concepts that are difficult to understand, hands-on experiments are used to deepen comprehension, while practical applications are briefly touched upon.
19. The assignments consist of past exam questions, categorized by chapter or knowledge point to cover each test point as comprehensively as possible. Through grading these assignments, we aim to gauge students' understanding and mastery of the material.
20. For the topic of fields, you can teach by comparing the three types of fields, enabling students to discover their similarities and differences. Quantumization can be understood by connecting macroscopic real-life examples with quantized quantities for comparison.
21. Web-based demonstration experiments, along with videos of experimental phenomena, can enhance students' understanding of the knowledge points.
22. Performance analysis, assignment feedback.
23. During the new lesson, learning guides will be used to organize the knowledge points.
24. Before introducing new knowledge, review relevant prior knowledge to help them connect the old with the new.
25.

The answer of the second teacher:

1. 15 years.
2. relevant stories
3. All of these factors need to be taken into consideration.
4. Logical gradient.
5. According to actual needs.
6. Taking into account the classroom context and students' existing knowledge base, teachers can ask questions in class and have students do presentations. After-class assignments. Using the questions from past exam paper.
7. Simulation animations, experiment videos, and other resources.
8. Simulation software, individual spot checks, and other methods. These can provide a relatively comprehensive understanding of students' learning status, enabling the development of targeted classroom designs.
9. Student feedback, performance analysis, assignments.

10. Design learning guides and guided materials that can be used during the preview stage outside of class, as well as for review and reinforcement.
11. Teach students according to their aptitude, design questions of varying difficulty levels, and provide contest coaching, among other approaches.
12.
The test result from multi-disciplinary teachers:

Evaluation Dimension	Specific Experience Description	5 - Strongly Agree	4 - Somewhat Agree	3 - Neutral	2 - Somewhat Disagree	1 - Strongly Disagree
1. Understandability	The language of the guide is easy to understand, without too much professional terminology barrier.	☐	☑	☐	☐	☐
2. Operational Confidence	After reading the guide, I am confident I can complete the experiment/demonstration independently.	☐	☐	☑	☐	☐
3. Principle Communication	I roughly understood the core physical principles behind it.	☐	☑	☐	☐	☐
4. Clarity of Steps	The operation steps are clearly described, and I know what to do at each step.	☐	☐	☑	☐	☐
5. Accessibility of Materials	The materials listed in the guide are easy to obtain.	☑	☐	☐	☐	☐
6. Teaching Practicality	If I were to teach students, this guide would indeed be helpful.	☐	☑	☐	☐	☐
7. Visual Friendliness	The layout/illustrations are clear and help in understanding the content.	☐	☑	☐	☐	☐
8. Overall Recommendation	I would recommend this guide to other teachers not majoring in physics.	☐	☑	☐	☐	☐

Evaluation Dimension	Specific Experience Description	5 - Strongly Agree	4 - Somewhat Agree	3 - Neutral	2 - Somewhat Disagree	1 - Strongly Disagree
1. Understandability	The language of the guide is easy to understand, without too much professional terminology barrier.	☐	☑	☐	☐	☐
2. Operational Confidence	After reading the guide, I am confident I can complete the experiment/demonstration independently.	☑	☐	☐	☐	☐
3. Principle Communication	I roughly understood the core physical principles behind it.	☑	☐	☐	☐	☐
4. Clarity of Steps	The operation steps are clearly described, and I know what to do at each step.	☑	☐	☐	☐	☐
5. Accessibility of Materials	The materials listed in the guide are easy to obtain.	☑	☐	☐	☐	☐

ISSN 2959-6149

Evaluation Dimension	Specific Experience Description	5 - Strongly Agree	4 - Somewhat Agree	3 - Neutral	2 - Somewhat Disagree	1 - Strongly Disagree
6. Teaching Practicality	If I were to teach students, this guide would indeed be helpful.	☑	☐	☐	☐	☐
7. Visual Friendliness	The layout/illustrations are clear and help in understanding the content.	☐	☑	☐	☐	☐
8. Overall Recommendation	I would recommend this guide to other teachers not majoring in physics.	☑	☐	☐	☐	☐

Evaluation Dimension	Specific Experience Description	5 - Strongly Agree	4 - Somewhat Agree	3 - Neutral	2 - Somewhat Disagree	1 - Strongly Disagree
1. Understandability	The language of the guide is easy to understand, without too much professional terminology barrier.	☑	☐	☐	☐	☐
2. Operational Confidence	After reading the guide, I am confident I can complete the experiment/demonstration independently.	☐	☑	☐	☐	☐
3. Principle Communication	I roughly understood the core physical principles behind it.	☐	☑	☐	☐	☐
4. Clarity of Steps	The operation steps are clearly described, and I know what to do at each step.	☐	☑	☐	☐	☐
5. Accessibility of Materials	The materials listed in the guide are easy to obtain.	☐	☐	☑	☐	☐
6. Teaching Practicality	If I were to teach students, this guide would indeed be helpful.	☐	☐	☑	☐	☐
7. Visual Friendliness	The layout/illustrations are clear and help in understanding the content.	☐	☑	☐	☐	☐
8. Overall Recommendation	I would recommend this guide to other teachers not majoring in physics.	☐	☐	☑	☐	☐

The test result from a professional physics teacher:
Scientific Accuracy 8 / 10 Core concepts are correct, but there is some terminology misuse (confusion between electric field / magnetic field) and one description of a principle is not rigorous enough (analysis of relay in 2.4e).
Language & Organization 9 / 10 The language is fluent, the steps are clear, and it is very friendly for interdisciplinary teachers. There are basically no grammatical errors.
Independent Completion 8 / 10 Materials are easy to obtain (video), but the guide relies on the teacher, requiring the teacher to have some foundational knowledge.
Illustrations & Layout 9 / 10 The images have a strong correlation with the text.
Inspiration 9 / 10 This is the biggest strength of the guide. It extensively uses questioning, group discussions, and analysis of error cases, effectively promoting deep thinking through social interaction learning.