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STUDENT PERSPECTIVES ON TEACHING AND LEARNING IN PHYSICS FOR NON-MAJORS: AN ANALYSIS OF COURSE FEEDBACK AND ENGAGEMENT

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Abstract:

Many students outside the sciences often view physics as a challenging subject, primarily due to its abstract concepts and reliance on mathematics. This study sets out to understand how undergraduates evaluate the Physics for Non-Majors course, which is part of the Bachelor of Science (Hons.) in Industrial Hygiene Technology and Safety program at Universiti Teknologi MARA (UiTM), Shah Alam. A survey was conducted with 35 students to examine their prior exposure to physics, their level of satisfaction with the course material, their views on the teaching methods, and the relevance of the course to their future work. The results showed that most students (91.2 percent) had studied physics before and that many rated the course positively. Almost half of them (47.1 percent) gave the overall quality a score of "4," while 29.4 percent rated it "5." Students highlighted topics such as Vectors, Thermal Physics, and Electric Current as the most engaging, since these had clear links to industry, while more abstract areas were rated less favorably. Although students were generally satisfied, their interest in pursuing further studies in physics remained moderate. These findings suggest that when physics is taught with practical examples and an emphasis on active learning, students are more likely to appreciate its importance. Improvements could include stronger emphasis on workplace applications, the use of digital tools and simulations, and additional support for students who begin with weaker foundations

Keyword:

Contextual Learning, Industrial Safety, Non-Majors, Physics Education, Student Perceptions

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Introduction

TPhysics is often regarded as a cornerstone of the sciences because it explains natural phenomena and provides the basis for technological progress across many disciplines. Its principles are central not only to engineering and medicine but also to industry and safety management, making it essential to higher education. Yet students outside the sciences frequently perceive physics as overly abstract, mathematically complex, and disconnected from their immediate academic or career goals (Hazari, 2022s). When course content is not clearly aligned with professional needs, motivation declines, engagement weakens, and knowledge retention suffers.

At Universiti Teknologi MARA (UiTM), Physics for Non-Majors is a compulsory subject for undergraduates in the Bachelor of Science (Hons.) program. Industrial Hygiene Technology and Safety program. The course is designed to provide students with a working knowledge of physics concepts that are directly applicable to workplace safety, hazard control, and industrial operations. For example, electrical safety procedures rely on an understanding of electric current; addressing thermal risks requires knowledge of heat transfer; and evaluating ergonomics or accident prevention involves applying principles of force and motion. Despite this practical orientation, some students continue to question the usefulness of physics, particularly when it is taught in a highly theoretical manner with limited links to real-world safety practices. Scholars have noted that when physics courses integrate active learning strategies, such as case studies, simulations, or problem-based tasks. Students demonstrate greater engagement and stronger conceptual understanding (Rianti, 2024). This pattern has been widely observed across contexts, but research on it in Malaysia remains relatively scarce. Studies focusing on occupational hygiene and safety programs are limited, even though these students represent a unique group whose professional practice requires applied knowledge rather than purely theoretical competence.

This study was therefore undertaken to investigate student perceptions of the Physics for Non-Majors course at UiTM Shah Alam. Specifically, it explores students' prior exposure to physics, their satisfaction with course delivery, and their views on its relevance to future careers in occupational health and safety. By addressing these questions, the study provides evidence-based insights that can inform teaching strategies, improve contextualization, and enhance learning outcomes. The findings are significant for instructors, curriculum designers, and higher education policymakers who seek to make physics instruction more relevant to applied science programs. The remainder of the paper is organized as follows: first, a review of existing literature on non-major physics education; second, an explanation of the research methodology; third, a presentation and discussion of the findings; and finally, a conclusion with implications and recommendations for future research.

Literature Review

This literature review discusses five main points related to the teaching and learning of Physics for Non-Majors. These include: (1) the importance of physics in non-major courses, (2) common challenges faced by non-major students, (3) instructional strategies for non-majors, (4) contextualization and relevance for motivation, and (5) student attitudes, engagement, and technology-enhanced learning. Together, these themes provide a foundation for understanding how physics can be made more meaningful and effective for students outside the physical sciences.

The Importance of Physics in a Non-Major Course

Physics is often described as one of the basic sciences because it explains how matter and energy interact in the natural world. For this reason, many university programs, including those outside the natural sciences, still include physics in their curriculum to help students develop scientific reasoning and quantitative skills. These skills are particularly valuable in applied fields such as engineering, occupational health, and industrial safety, where decisions often depend on understanding mechanical systems, energy transfer, and exposure to hazards. For instance, managing vibration, controlling heat stress, and reducing electrical risks all require knowledge of fundamental physical principles. However, students who are not physics majors frequently view the subject as abstract, mathematically challenging, and unrelated to their future careers. Kalender et al. (2019) noted that such perceptions can reduce students' motivation and persistence, leading to weaker learning outcomes. The problem is not only that the material is difficult, but also that students sometimes cannot see why it matters to their professional lives. When this link is missing, they may focus solely on passing exams rather than developing a deeper understanding. Contextualization is therefore important because it helps learners relate the subject matter to their chosen field. In industrial safety and hygiene, this involves demonstrating how physical concepts are applied to hazard analysis, accident prevention, and risk assessment. Without these connections, students may finish the course without being able to apply what they have learned in practice.

Common Challenges Faced by Non-Majors in Physics

Prior research indicates that physics presents both cognitive and emotional challenges for non-majors. The heavy reliance on mathematics is a major difficulty, with algebra and trigonometry forming the foundation for most problem-solving tasks. Students who lack confidence in their mathematical ability often struggle to engage fully with physics (Sharma, 2025). Abstract principles such as force, motion, and energy can also be difficult to grasp, particularly when taught primarily through symbols rather than real-world examples. Traditional lecture-based approaches tend to reinforce these difficulties, promoting passive learning and leaving little room for active participation or conceptual growth (Hultquist, 2024). Several studies suggest that these barriers gradually erode students' initial interest. As noted by Yusoff and Ibrahim (2021), many learners begin physics courses with a neutral or positive outlook, only to become discouraged by the end. Similar patterns have been reported in Malaysia, where students often regard physics as a subject for specialists and doubt their own problem-solving skills (Lau & Tan, 2022). Without targeted interventions, non-majors are likely to disengage, reinforcing the perception of physics as inaccessible.

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Instructional Strategies for Non-Majors

A growing body of research highlights that interactive teaching strategies not only help students understand physics concepts but also develop more positive attitudes toward the subject. These approaches encourage learners to explain ideas in their own words, predict outcomes, and engage in peer discussions. Kamran (2023) conducted a large meta-analysis and found that interactive engagement produces significantly better learning outcomes than traditional lectures. One widely cited method is Peer Instruction, developed by Mazur, which combines short conceptual questions with peer discussions and instructor feedback. This approach has improved conceptual understanding among both science majors and non-majors (Mazur & Watkins, 2023). Another strategy is Modelling Instruction, where students build and test physical models. Brewe et al. (2009) reported that this approach helps to reverse the decline in attitudes often seen in traditional courses. By prioritizing reasoning and application instead of memorization, such methods present physics as a set of useful tools rather than a list of formulas, making the subject more accessible to non-major students

Contextualization for Relevance and Motivation

Active learning strategies alone may not always be sufficient to convince students that physics is worth studying. Many students outside the field still question why the subject is included in their program. Previous research has shown that when physics is connected to situations students already know, either from daily life or their future profession, it becomes more meaningful and motivating. Pliner et al. (2022) reported that courses that presented physics in biological and medical contexts, such as biomechanics or energy metabolism, led to higher levels of engagement and better understanding. Similarly, Gungor et al. (2020) found that using real-life examples in teaching reduced anxiety and increased interest in science. For students in occupational safety and hygiene, contextualization may involve linking topics such as heat transfer, vibrations, fluid dynamics, and electricity to actual workplace hazards and safety measures. Understanding heat conduction, for example, is vital for managing thermal risks in confined spaces, while knowledge of electrical circuits is necessary to apply lockout/tagout procedures. These examples help students see physics not only as a theory but also as a set of principles that support professional practice and career preparation.

Problem-Based and Case-Based Learning

Problem-based learning (PBL) and case-based instruction are recognized as approaches that give students the opportunity to engage with physics in practical and applied settings. Instead of routine exercises that have a single solution, these methods expose learners to real-world problems that demand careful analysis and informed judgment. Pinto (2025) reported that PBL improves collaboration, encourages critical thinking, and develops problem-solving skills. In safety-related programs, using case studies of industrial accidents or hazard-control measures helps students apply physics concepts to scenarios that closely mirror their professional environments. These practices not only make the learning process more interactive and engaging but also emphasize the value of physics knowledge for future workplace responsibilities.

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Student Attitudes and Engagement in Physics

Students' attitudes play a central role in shaping students' performance in physics. Previous studies indicate that traditional lecture-based classrooms often lead to a gradual decline in both interest and confidence (Alaagib et al., 2020). In contrast, when teaching methods involve contextualization, problem-based learning, or peer instruction, students tend to report more positive experiences and greater engagement (Amerstorfer, 2021). This distinction is important for non-majors, since many of them will not take another physics course after completing this one. A poor first experience can discourage them from applying physics concepts later in their studies or careers, and a positive encounter can help them appreciate its value and recognize its relevance in professional practice.

Technology-Enhanced Learning in Physics Education

Recent international research in physics education has increasingly emphasised the role of technology-enhanced learning environments in improving student engagement and motivation, particularly among non-major students. Digital tools such as simulations, interactive platforms, and online learning systems have been shown to support conceptual understanding and reduce anxiety associated with abstract physics content. These approaches allow learners to visualise physical phenomena and actively engage with concepts that may otherwise be difficult to grasp through traditional instruction alone. More recently, gamification has emerged as a promising strategy in physics education. Manoharan & Nagulapally (2023) demonstrated that adaptive gamification techniques can enhance student motivation and engagement by tailoring challenges and feedback to individual learning progress. International reviews of physics education research similarly highlight that technology-supported and learner-centred approaches are especially effective for students whose primary academic focus lies outside the physical sciences. Together, these findings suggest that integrating digital and interactive learning tools provides an important global framework for designing non-majors physics courses that promote engagement, relevance, and meaningful learning experiences.

Gaps in the Literature

Although various studies have examined the teaching of physics, two important gaps remain. The first is that most existing studies focus on physics for engineering or life science students, leaving very little direct evidence about how students in occupational safety and industrial hygiene programs experience the subject. Learners in these fields require practical knowledge that can be applied in the workplace, rather than purely abstract theories. The second gap concerns the Malaysian context, where research remains limited, and findings from Western settings may not be directly applicable because of cultural and curricular differences. To address these shortcomings, the present study focuses on students in UiTM Shah Alam's Industrial Hygiene and Safety program. Specifically, it explores how they perceive the Physics for Non-Majors course, examining their views on the content, the teaching approaches, and the overall learning experience. The insights obtained are intended to inform the improvements in curriculum design and delivery.

Methodology

This methodology section discusses five main components of the study: (1) research design, (2) participants, (3) research instrument, (4) procedure and ethical considerations, and (5) data analysis. Together, these components explain how the study was conducted to explore students' perceptions of the Physics for Non-Majors course.

Research Design

This study adopted a quantitative descriptive design with an exploratory, pilot-study orientation to examine students' perceptions of a Physics for Non-Majors course offered within an occupational safety–related academic program. The design was selected to obtain an initial understanding of how non-science majors perceive the relevance, delivery, and applicability of physics concepts to their field of study. Given the course's context-specific nature and the small cohort size, the study was not intended to generate generalisable findings. Instead, it aimed to provide preliminary insights that may inform future curriculum refinement and support subsequent, larger-scale investigations in similar educational settings. A structured survey was used as the primary data collection method because it allowed identification of overall trends in students' perceptions while remaining suitable for an exploratory study involving a single cohort.

Participants

The participants were 34 undergraduate students enrolled in the Physics for Non-Majors course at Universiti Teknologi MARA (UiTM) in Shah Alam during the October 2024 academic semester. All participants were enrolled in the Bachelor of Science (Hons.) in Industrial Hygiene Technology and Safety programme, in which the physics course is compulsory.

Most respondents (91.2%) reported prior exposure to physics, while 8.8% reported no prior background in the subject. This variation reflects differences in students' academic preparedness and provides relevant context for interpreting their perceptions of course difficulty, engagement, and instructional effectiveness.

Instrument

Data were collected using a structured questionnaire comprising ten closed-ended items and one open-ended question. The closed-ended items were measured using a five-point Likert scale ranging from 1 (Very Poor/Strongly Disagree) to 5 (Excellent/Strongly Agree). These items assessed students' perceptions of course content quality, suitability for non-majors, balance between theoretical concepts and practical applications, instructional effectiveness, and overall satisfaction with the course. The open-ended question invited students to identify physics topics or learning activities they found most engaging. This item was included to provide qualitative context for the quantitative findings and to capture aspects of the student experience that may not be fully reflected in fixed-response items, particularly given the exploratory nature of the study.

Procedure and Ethical Considerations

The survey was administered online at the end of the semester, after students had completed all course-related assessments. Participants were informed of the study's purpose and assured that their participation was voluntary. They were explicitly informed that their decision to participate or not would have no impact on their course grades or academic standing. Anonymity and confidentiality were maintained throughout the data collection process. Ethical

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approval for the study was obtained through institutional academic approval procedures at Universiti Teknologi MARA, in accordance with standard ethical guidelines for educational research involving human participants. Informed consent was obtained from all respondents prior to participation.

Data Analysis

Quantitative data were analysed using descriptive statistics, including frequencies and percentages, to summarise student responses and identify general patterns in perceptions. Given the study's limited sample size and exploratory intent, inferential statistical analyses were not conducted. Responses to the open-ended question were analysed using a basic thematic approach, whereby recurring ideas and patterns were identified and grouped into common themes. These qualitative insights were used to complement and contextualise the quantitative results, thereby enhancing the interpretive depth of the findings.

Ethical Considerations

Ethical considerations were addressed in accordance with institutional guidelines for educational research at Universiti Teknologi MARA (UiTM). Participation in the study was entirely voluntary, and students were informed of the research's purpose before completing the survey. It was clearly communicated that participation, or non-participation, would have no effect on course grades or academic standing. Anonymity and confidentiality of responses were maintained throughout the data collection process. Informed consent was obtained from all participants before they took part in the study, and the data were used solely for research purposes.

Results And Discussion

Prior Experience with Physics

Students' prior exposure to physics is summarised in Table 1. The findings indicate that most respondents had studied physics before enrolling in the Physics for Non-Majors course, suggesting that many students entered the course with foundational knowledge that supported engagement with new and more complex concepts. Prior exposure to a subject has been associated with improved conceptual integration and reduced cognitive load, particularly in disciplines such as physics that are often perceived as abstract and mathematically demanding (Ngu et al., 2023). At the same time, the presence of students with no prior physics background underscores the cohort's heterogeneity. For these learners, physics concepts may represent a new and potentially challenging domain. This reinforces the importance of inclusive instructional strategies that accommodate varying levels of preparedness. Research suggests that appropriate scaffolding, supplementary learning resources, and interactive teaching approaches can help reduce learning gaps between students with different academic backgrounds (Finn & Tauber, 2015). Moreover, prior exposure does not always translate into confidence or positive attitudes, as some students may carry negative perceptions from earlier learning experiences (Palmer, 2002). Therefore, instruction should not only build upon existing knowledge but also actively reshape attitudes by emphasising the relevance of physics to occupational safety and industrial hygiene.

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Table 1: Prior Experience with Physics

Response	Frequency	Percentage
Yes	32	91.2 %
No	3	8.8 %

Source: Author's own work

Overall Quality of Course Content

Regarding course content quality, Table 2 indicates that students generally perceived the course material as well-structured and relevant to their programme of study. This suggests that the organisation and sequencing of the content supported student understanding. Well-structured instructional materials have been shown to play a critical role in sustaining engagement and promoting learning among non-major students (Choi & Yang, 2024). However, the presence of neutral responses suggests that the content may not have been equally meaningful for all learners. This variation may reflect differences in learning expectations or the extent to which students were able to connect theoretical concepts with real-world applications. As noted by Clark (2023), effective teaching of physics for non-majors requires deliberate contextualisation to bridge abstract principles with practical experiences. The findings of this exploratory study suggest that greater integration of industry-relevant examples, particularly those related to workplace safety and hazard prevention, could further enhance students' perception of content relevance.

Table 2: Overall Quality of the Course Content

Rating	Frequency	Percentage
1	0	0
2	0	0
3	8	23.5%
4	16	47.1%
5	10	29.4%

Source: Author's own work

Appropriateness for Non-Major Students

The results in Table 3 suggest that students generally perceived the course as appropriate for a non-major audience. No respondents indicated that the course was unsuitable, implying reasonable alignment between the course level and students' academic backgrounds. Such alignment is particularly important in courses designed for non-science majors, who may struggle when content is delivered in highly technical or abstract forms (Almasri et al., 2021). At the same time, a proportion of neutral responses indicates that some students remained uncertain about how well the course met their learning needs. This finding reflects broader challenges in physics education, where achieving both accessibility and professional relevance for diverse student populations remains a key concern (White & Williams, 2017). As this study is exploratory, the results point to opportunities to further refine course design to better address the expectations and professional aspirations of non-major students.

Table 3: Appropriateness of Content for Non-Major Audience

Rating	Frequency	Percentage
1	0	0
2	0	0
3	11	32.4 %
4	15	44.1 %
5	8	23.5 %

Source: Author's own work

Balance Between Theory and Practice

Students' views on the balance between theoretical explanations and practical examples are reflected in Table 4. The findings indicate that students generally appreciated the integration of applied examples alongside conceptual instruction. This observation aligns with existing literature suggesting that non-majors are more engaged when physics concepts are connected to real-world applications (Pacadaljen, 2024). Applied examples related to occupational safety, such as heat exposure, electrical hazards, or mechanical forces, may help students visualise how physics principles operate in workplace settings. Despite these positive perceptions, the exploratory nature of the study suggests opportunities for further enhancement. Previous research has shown that simulations, laboratory demonstrations, and case-based learning can deepen understanding and promote long-term retention (Felemban et al., 2025). Expanding the use of such approaches may further strengthen students' appreciation of the relationship between theory and practice.

Table 4: Balance Between Theory and Practical Examples

Rating	Frequency	Percentage
1	0	0
2	0	0
3	6	17.6 %
4	19	55.9 %
5	9	26.5 %

Source: Author's own work

Instructor's Communication Skills

Students' evaluations of the instructor's communication skills, as shown in Table 5, indicate high levels of satisfaction with instructional clarity and delivery. Effective communication is particularly important in courses designed for non-majors, as students may lack familiarity with technical terminology or advanced mathematical reasoning. Research has demonstrated that instructors who use clear explanations, analogies, and real-life examples can reduce anxiety and support comprehension among learners (Azer et al., 2013). The positive perceptions observed in this study suggest that instructional delivery contributed to a supportive learning environment. Nevertheless, previous studies indicate that interactive teaching tools, such as guided discussions, real-time feedback systems, and visual simulations, can further enhance engagement and active learning (Barbetta, 2023). These strategies may offer additional opportunities to strengthen student participation in future course offerings.

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Table 5: Instructor's Ability to Communicate Complex Ideas

Rating	Frequency	Percentage
1	0	0
2	0	0
3	5	14.7 %
4	15	44.1 %
5	14	41.2 %

Source: Author's own work

Interest in Further Study of Physics

Students' interest in pursuing further physics-related learning is summarised in Table 6, revealing mixed levels of motivation. While some students expressed interest in continued engagement with physics, a substantial proportion reported uncertainty. This suggests that although the course was engaging for some learners, others remained unconvinced of the value of pursuing further physics-related study. Research on inquiry-based and project-oriented learning suggests that hands-on, open-ended approaches can enhance motivation and sustained interest, particularly among non-major students (Đerić et al.,, 2021). In this pilot study, the findings indicate that increasing the use of inquiry-driven activities, collaborative projects, and problem-based tasks may strengthen students' willingness to explore physics beyond the course.

Table 6: Course Impact on Interest in Exploring Physics Topics

Rating	Frequency	Percentage
1	0	0
2	1	2.9 %
3	12	35.3 %
4	12	35.3 %
5	9	26.5 %

Source: Authors owns work

Usefulness for Future Careers

Students' perceptions of the applicability of physics knowledge to future professional contexts are outlined in Table 7. The results indicate moderate confidence, with some uncertainty about how directly the course supports workplace needs. Similar patterns have been reported in previous studies, where students struggled to connect foundational physics concepts to professional requirements unless explicit guidance was provided (Fraser et al., 2014). In the context of occupational safety and industrial hygiene, clearer alignment between physics concepts and professional practice may strengthen perceived relevance. For example, linking heat transfer to heat stress management, or connecting electrical circuits to electrical hazard identification and prevention, can help students recognise the practical value of physics knowledge beyond the classroom (Zárate-Navarro et al., 2024). Industry-based case studies, scenario-based discussions, and collaborative projects that mirror workplace decision-making may further bridge the gap between theory and application and better prepare students for future employment (Syarifuddin et al., 2025).

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Table 7: Likelihood of Applying Course Knowledge to Future Studies or Career

Rating	Frequency	Percentage
1	0	0
2	3	8.8 %
3	13	38.2 %
4	14	41.2 %
5	4	11.8 %

Source: Authors' owns work

Overall Satisfaction

Overall satisfaction with the course, as reflected in Table 8, was generally positive, suggesting that the course structure and delivery met the expectations of most respondents. This finding aligns with earlier research indicating that structured and contextualised instruction can enhance engagement and confidence among non-major students (Chang, 2025). As this study represents an initial exploration, continued refinement of course design and delivery will be necessary to maintain and further improve student satisfaction. Incremental improvements, such as enhanced contextual examples and diversified instructional strategies, may further strengthen students' overall learning experience in future course offerings.

Table 8: Overall Satisfaction with the Course

Rating	Frequency	Percentage
1	1	2.9 %
2	0	0
3	8	23.5 %
4	15	44.1 %
5	10	29.4 %

Source: Authors' own work

Preferred Topics

Students' preferred topics are summarised in Table 9. The results indicate stronger engagement with topics that have clearer industrial applications, such as vectors, thermal physics, and electric current. In contrast, more abstract topics, including uniform circular motion and impulse and momentum, were less frequently identified as engaging. This preference pattern suggests that students are more responsive when physics concepts are closely linked to familiar workplace contexts. Prior research confirms that connecting physics principles to real-world experiences can increase both motivation and conceptual understanding among non-major students (Choi & Yang, 2024). Abstract topics may therefore require additional instructional support, such as demonstrations, visual simulations, or problem-based learning activities, to enhance engagement and reduce the perceived gap between theory and practice (Hung, 2011).

Table 9: Most Liked Topics in the Course

Topic	Percentage (%)
Measurements	14.7
Vectors	20.6

Kinematics in One Dimension	5.9
Newton’s Law	5.9
Work and Energy	5.9
Impulse and Momentum	2.9
Uniform Circular Motion	0
Thermal Physics	20.6
Electrostatics	2.9
Electric Current	20.6

Source: Authors’ own work

Conclusion

The findings of this exploratory study indicate that students generally held positive perceptions of the Physics for Non-Majors course. Overall, students expressed satisfaction with the course content, instructional clarity, and the extent to which physics topics were linked to workplace-related applications. These results suggest that the course has been successful in supporting student engagement and understanding within a non-major context. At the same time, the findings also reveal areas that require further attention. Students’ interest in pursuing further studies in physics was moderate, and some respondents expressed uncertainty about how directly physics knowledge contributes to their future professional practice. These mixed responses indicate that while the course has met several of its intended objectives, there are opportunities to further strengthen its relevance and impact. To address these gaps, future course improvements may include greater emphasis on active learning, industry-based case studies, and digital and interactive tools. Such strategies can enhance student engagement and help learners better connect physics concepts to real-world occupational safety and industrial hygiene scenarios. In addition, providing targeted support for students with weaker prior backgrounds in physics may help ensure more equitable learning experiences and build confidence across the cohort. Overall, this study provides preliminary insight into how physics can be effectively positioned for non-major students, not merely as a theoretical subject, but as a practical tool that supports hazard prevention, accident analysis, and workplace safety. Strengthening the connection between course content and real-world applications may further enhance students’ appreciation of the relevance of physics to their professional development. While the findings are context-specific, they offer useful guidance for ongoing curriculum refinement and for future research involving larger, more diverse student populations.

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Author Contribution Statement:	The author was responsible for conceptualization, research design, data collection, analysis, interpretation of findings, and manuscript preparation. The author has read and approved the final version of the manuscript prior to submission.

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