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Empowering Physics Learning Plan Subjects with IFTAR Digital Module: A Study of Validity and Practicality

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Abstract: Sociaty 5.0 era has placed artificial intelligence (AI) and the internet of things (IoT) as fundamental aspects of human activity. The Indonesian government has paid great attention to the digitisation of learning through a curriculum that focused to use of technology, project-based learning, and the strengthening of digital competencies relevant to the needs of industry and society. However, facts in the field show that the learning tools developed by students as prospective teachers still don't make optimal use of technology. The purpose of this study is to produce digital modules that are valid in terms of material, media, and construct and are practical for use in physics-based learning. Implications. This study used Plomp's research design, which consists preliminary research, prototyping phase, and assessment phase. The prototyping phase included Kemp's learning model design, product design, and product quality testing in the form of validity and practicality. The findings state that the validity according to experts is 0.90 (very high), the practicality according to lecturers is 0.93 (very high), and according to students is 0.92 (very high). This study is expected to improve students' pedagogical competence, encourage the optimal use of ICT, develop digital teaching material development skills, and strengthen academic character.

Keywords: Digital Module; IFTAR; Physics Learning; Practicallity; Validity

Introduction

Sociaty 5.0 era has brought major changes to almost all sectors of life, where digital technology is integrated with artificial intelligence (AI) and the internet of things (IoT) in human activities. Digital transformation is not only happening in the economic, industrial and governmental fields, but also spreading to the education sector, which is required to be adaptive, flexible and innovative. Conventional learning, which relies solely on face-to-face interaction, is shifting towards technology-based digital learning. Modern learning systems focused the use of learning management systems, digital teaching materials, and automated assessment to support the achievement of 21st-century competencies (Desnita et al., 2022). This change has been further strengthened by the COVID-19 pandemic, which has accelerated the digitalisation of education. Students, as future professionals, are required to master digital literacy, critical thinking, and the ability to collaborate through digital media (Natasya et al., 2025). Therefore, the design of digital teaching materials has become a priority that needs to be developed to address the challenges of learning today.

As a strategic step, the Indonesian government has paid great attention to the digitisation of learning through the implementation of the Merdeka Belajar–Kampus Merdeka (MBKM) curriculum in higher education. This curriculum emphasises the use of learning technology, project-based learning, and the strengthening of digital competencies relevant to the needs of industry and society. The Ministry of Higher Education, Science, and Technology (Kemdiksaintek) also encourages campuses to develop digital teaching materials, online learning platforms, and technology-based learning tools. MBKM provides space for students to innovate and apply technology in the learning process, both independently and collaboratively across study programmes. Thus, the

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development of digital learning tools is an important part of supporting curriculum implementation and enhancing graduates' readiness to face global digital transformation (Anggraeni et al., 2020)(Susanto et al., 2024).

However, in practice, particularly in the Physics Education Study Programme, the learning tools developed by students as prospective teachers still do not make optimal use of technology (Natasya et al., 2024). Learning designs still predominantly use printed modules, traditional lesson plans, and text-based teaching materials without interactive elements. Students are not yet accustomed to utilising multimedia, AI, or learning authoring tools to develop digital learning tools based on the needs of learners (Aiken, 2022). This situation has led to a gap between the digital competencies expected by the curriculum and the actual abilities of prospective teacher students. Limited use of technology also has an impact on the monotony of the learning process and the low level of learner engagement when learning tools are used in microteaching and teaching practice activities.

Previous studies have shown that the low utilisation of ICT in the development of learning tools for prospective teachers is due to a lack of digital literacy, perceptions of difficulty in using technology, a lack of intensive training, and the unavailability of digital learning tools that can be used as references. In addition, some students consider that the development of digital modules requires a high level of technical skills, so they lack confidence to develop them (Lidia & Nugroho, 2018) (Wahyudi & Lestari, 2019)(Apriyani et al., 2020). Several studies also conclude that prospective teachers tend to focus on the cognitive aspects of the material rather than the design of learning technology (Febriyana et al., 2023). These conditions show that technical and psychological factors are the main causes of the suboptimal integration of ICT in the learning tools of prospective physics teachers.

At the same time, previous research also revealed gaps that need to be addressed. Most research on the development of digital teaching materials in the field of physics education has only focused on multimedia-based e-modules and has not touched on the integration of ethno-religious aspects and artificial intelligence as learning aids (Fitrisyah & Mulyono, 2025). Most research on the development of digital teaching materials in the field of physics education only focuses on multimedia-based e-modules and has not touched on the integration of ethno-religious aspects and artificial intelligence as learning support (Eliza et al., 2025). In addition, there has not been much research on physics lesson planning courses that specifically address the needs of prospective teachers. This gap highlights the need for the development of innovative e-modules that are not only digital but also capable of internalising cultural and spiritual values while facilitating the pedagogical competence of prospective physics teachers.

Based on this urgency, the development of an integrated IFTAR Digital Module with ethno-religious values assisted by artificial intelligence is seen as a relevant solution. This module is in line with the demands of the digital age and the need for physics learning that not only focuses on mastering concepts but also on shaping the spiritual, social, and cultural character of students (Festiyed et al., 2022). The integration of AI enables dynamic content delivery, automatic feedback, personalised learning, and adaptive learning resource recommendations. Meanwhile, ethno-religious integration aims to balance academic competence with piety, religious moderation, and local wisdom, thus aligning with national education goals (Festiyed, 2024). Thus, the development of the IFTAR Digital Module has a strong rationale for responding to the demands of the 5.0 industrial revolution and the implementation of the MBKM curriculum in higher education.

This research has novelty in developing an ethno-religious and artificial intelligence-based Digital IFTAR Module for the Physics Learning Plan course and testing its validity and practicality as a learning tool for prospective physics teachers. The aim of the research is to produce a digital module that is valid in terms of material, media, and construct and is practical for use in physics-based learning. The implications of this research are expected to improve students' pedagogical competence, encourage the optimal use of ICT, develop digital teaching material development skills, and strengthen the academic and spiritual character of prospective educators. In addition, the results of this research are expected to become a model for innovative learning tools that can be replicated in other disciplines.

Method

This research into product development uses the Plomp model, consisting of three stages: preliminary research, prototyping and assessment (Yusliani, 2022). This article focuses on the prototyping phase, the process of which is illustrated by the following diagram:

Figure 1. Procedural Scheme

The instructional design uses the Kemp model, consisting of seven steps: formulating the Core

Curriculum and Sub-Curriculum (CPMK) and Sub-CPMK; needs analysis; strategy development; materials development; evaluation; implementation; and reflection. The product was designed using Canva software and then integrated into a Google Sites platform, which includes links to ChatGPT, WizerMe and Google Drive.

The validity and practicality of the measurement instrument were assessed using a questionnaire. Validity was assessed by five experts: three education experts and two IT experts. Practicality was assessed by 41 students and two lecturers on the physics lesson planning course. The results of the measurement were then analysed using the Aiken index.

Result and Discussion

The development of the IFTAR digital module in the prototyping phase follows these steps:

Designing Instructional

Instructional design using the Kemp model begins with formulating CPMK and sub-CPMK. CPMK is able to analyse the nature and steps of learning design, learning variables, principles of meaningful learning and assessment, strategies for organising learning objectives, and implementation of learning delivery strategies in accordance with the applicable curriculum, designing physics learning tools for senior high school consisting of Teaching Modules (MA) or Lesson Plans (RPP), LKPD and assessment sheets, presenting them in accordance with the facts and good presentation rules.

Sub CPMK includes: a. able to compare the differences between the 2013 curriculum and the independent curriculum in terms of learning planning and present them. b. Analyse learning variables, principles of meaningful learning and assessment, and present them. c. design strategies for organising learning objectives and implementing learning delivery strategies and present them. d. design senior secondary school physics learning tools consisting of teaching modules (student worksheets and assessment sheets), project modules and textbooks and present them. e. evaluate learning planning and learning tools used in schools

The research subjects were students of the Physics Education study programme, Faculty of Mathematics and Natural Sciences, UNP, who were active in the July-December semester of 2024/2025, enrolled in 2022, and took the Physics Learning Planning course. The educational background of the research subjects is 83.78% senior high school and 16.22% vocational high school. The subjects' areas of origin are 70.27% from regencies and 29.73% from cities. The average Cumulative Grade Point Average (CGPA) is 3.11, with a lower range of 2.72 and an upper range of 3.58.

The learning strategy chosen is classical with case methods, team-based projects, group discussions and presentations. The media used are simulations, animations and artificial intelligence. Materials are developed in accordance with the RPS designed and analysed based on case studies of implementation in the field. The assessment used employs an assessment as learning approach, which consists of: classical assessment, group assessment and individual assessment. This covers the implementation of learning that has been designed in such a way with the following schedule:

Table 1. Scheduling Research Activities in Physics Learning Planning Courses

Time	Activities
12-11- 2024	Initial observation of the learning process in class and interviews regarding the obstacles experienced by students in related courses.
19-11-2024	Project socialisation, distribution of assignment grids and division of groups among students using the IFTAR learning model assisted by digital modules.
26-11-2024	Collection and examination of instructional design assignments using grid tables to produce teaching modules and attachments in the form of student worksheets created collaboratively by students in groups.
3-12-2024	Review of instructional design assignments using a grid table to produce teaching modules and attachments in the form of student worksheets, as well as peer teaching trials for each group.
10-12-2024	Implementation and recording of student peer teaching activities guided by teaching modules assisted by LKPD, which have been designed by students themselves in groups.
17-12-2024	Collection of final reports and peer teaching videos from student groups that have been edited and uploaded to the IFTAR research YouTube channel.
24-12-2024	Presentation of final reports by students for 10 minutes for each group in turn.

After the group presentation, the lecturer always provides reflection and feedback on the presenting group's paper and PowerPoint presentation, which also serves as a guideline for revising all individual assignments. In addition, during the project implementation, students conduct independent reflections on the strategies designed to solve the identified problems and the aspects that need to be improved after the implementation of the strategies (peer teaching), where the solutions are viewed from scientific and religious perspectives..

Designing Products

Products in the form of Digital Modules based on the Integrated Ethno-Religious IFTAR Learning Model Assisted by Artificial Intelligence

Figure 2. Home

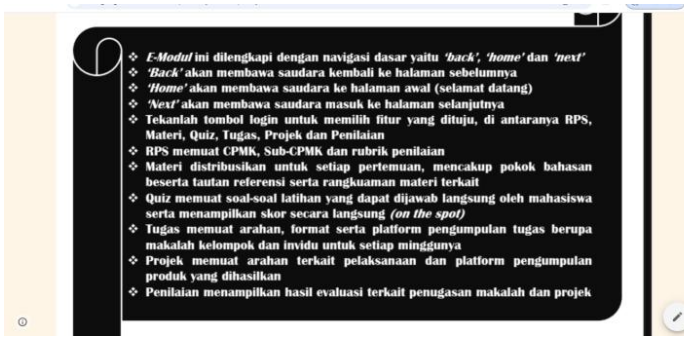

Figure 3. Instructions

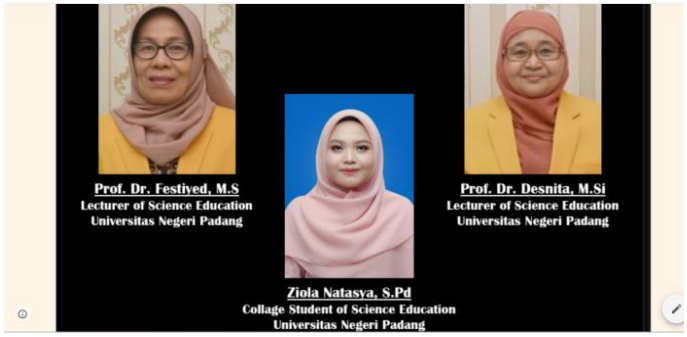

Figure 4. About Us

Figure 5. Menu

Figure 6. Navigation

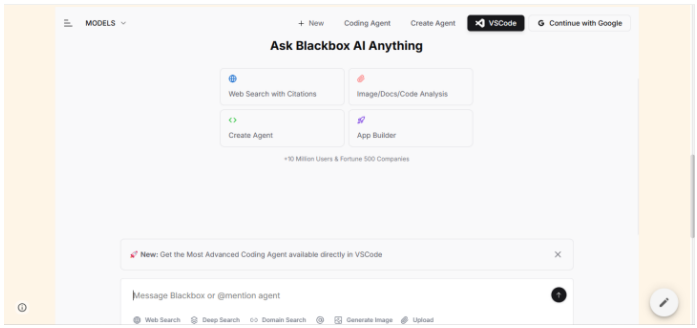

Figure 7. *Artificial Intelegence*

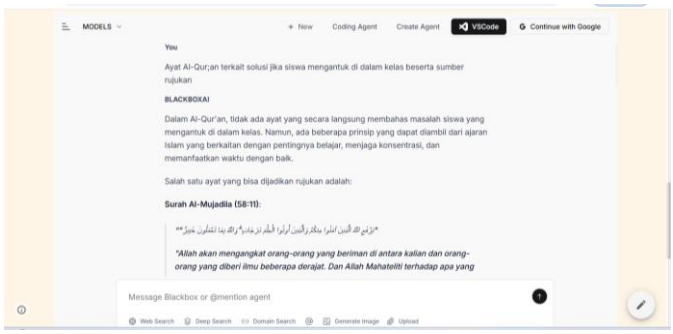

Figure 8. Paper

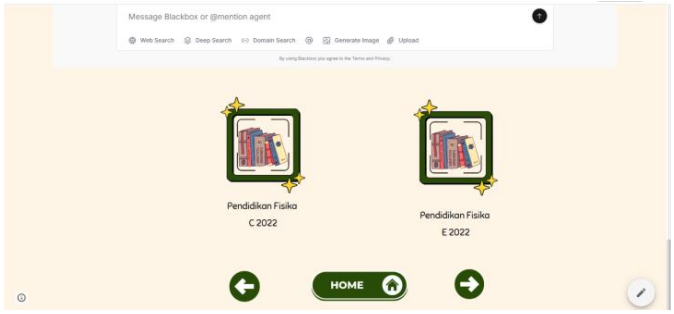

Figure 9. Paper

Figure 10. Project

Assesing Product Quality

Product quality in this article is assessed based on its validity and practicality, with the following details:

a. Validity

The validity assessment of the product is based on five aspects, including a) material substance, b) visual communication display, c) learning design, d) software utilisation, and e) learning model. Validation was

carried out by five experts in various fields, including three experts in education and two experts in IT. The validity of the five aspects was in the very high category, with details shown in the following graph:

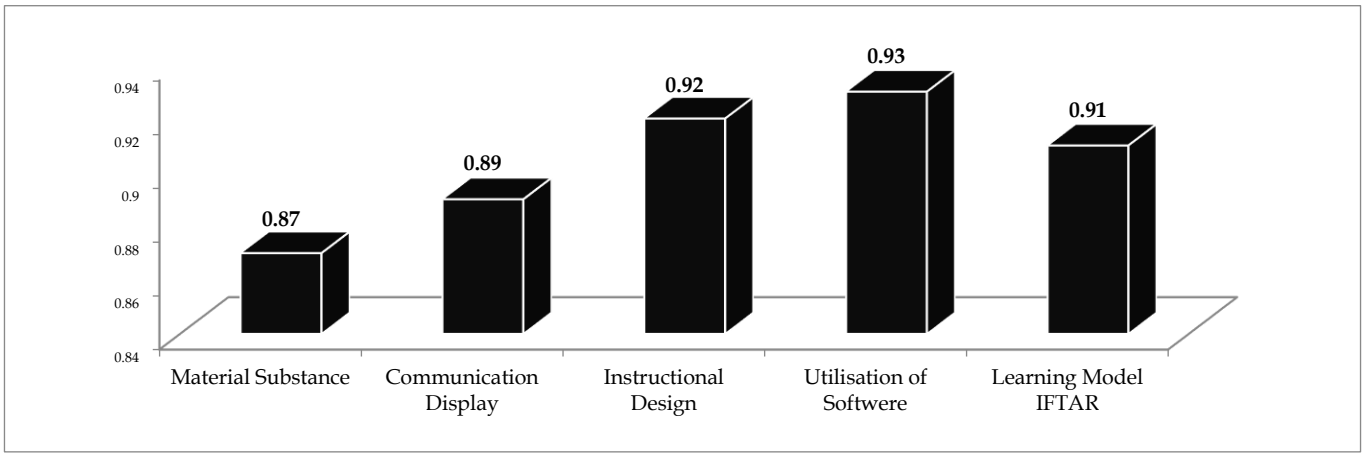

Figure 11. Validity Assessment by Experts

The graph shows that the "material substance" aspect has the lowest validity score among the other aspects. This is because the material has not been presented in detail and has not comprehensively integrated ethno-religious aspects. The integration of religious aspects is evident in almost all of the material content, but the cultural aspect still needs to be emphasised in several parts. Religion and culture are two very interesting aspects when combined to create novelty in developing a comprehensive and unique material concept.

On the other hand, the "utilization of software" aspect has the highest score among the other. This is because the product is very responsive to technological developments, where artificial intelligence is used to help students develop initial concepts related to questions that arise during the learning process. It is very important to remember that AI only displays all the information in its database related to the keywords entered, without any certainty as to its validity. Therefore, students as users need to analyse and be discerning in filtering accurate information.

b. Practicality

The practicality of the product was assessed based on four aspects, including a) ease of use, b) appeal, c) efficiency, and d) benefits, from the perspective of lecturers and students. The practicality assessment of the product was based on four aspects, including a). ease of use, b). attractiveness, c). efficiency, and d). benefits, according to the perspectives of lecturers and students. The product was tested by two lecturers and 41 students in a Physics Learning Planning course at one of Indonesia's State Universities of Education. The practicality assessment by lecturers and students was in the very high category, with details shown in Figure 12.

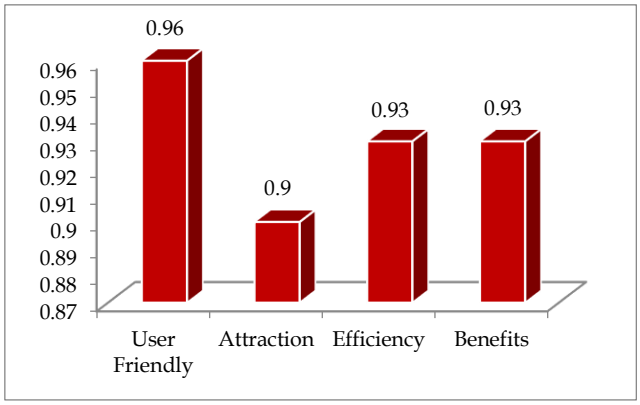

Figure 12. Practicality Assessment by Lecturers

The 'user friendly' aspect received the highest score from lecturers because the digital module developed has fulfilled the basic principles of a user-friendly interface. Simple navigation such as home, back, and next buttons has been proven to facilitate the process of moving between pages without confusing users. This finding is in line with Darwis (2025) view that ease of navigation is one of the main indicators in evaluating the usability of a digital product. A clear interface design can also improve users' perception of the quality and usability of digital modules (Wulff et al., 2022).

Furthermore, the accessibility of all external links integrated into the product, such as interactive quizzes, artificial intelligence tools, Google Drive, Google Docs, YouTube, and Google Scholar, also contributes to the high score in terms of ease of use. Cross-platform feature integration allows users to access materials, exercises, and additional references without any obstacles. This is in line with the findings of Han & Shim (2019), who stated that intermedia connectivity through active links can increase the efficiency of

digital learning. In addition, access to multi-format features also supports a more flexible and comprehensive learning experience (Fahrudin et al., 2025).

The ease of use experienced by lecturers indicates that the module design has accommodated both pedagogical needs and user technology preferences. Responsive digital modules that are easily accessible and integrated with various external sources are considered capable of improving learning effectiveness and lecturers' readiness to utilise digital devices. These findings reinforce the argument that ease of use is an important component in the successful implementation of digital learning media in higher education (Abas & Solihatin, 2019)(Zulaiha et al., 2019). Thus, the high scores in this aspect indicate the success of the module design in fulfilling the principles of simplicity, clarity, and accessibility.

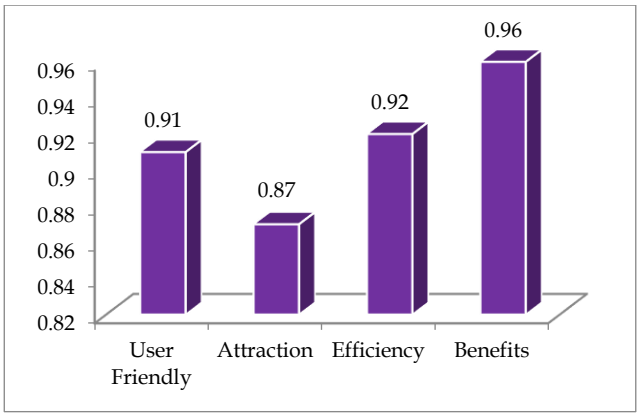

Figure 13. Practicality Assessment by Students

The students' view that places the utilisation of software as the highest score indicates that the use of modern digital devices provides a learning experience that is more relevant and adaptive to technological developments. The use of Google Sites as a website builder allows for the presentation of material in a structured format that is easily accessible across various devices. This is in line with the opinion of Abas and Solihatin (2019), who state that web-based platforms can increase the flexibility and convenience of learning because they can be accessed anytime and anywhere. Students tend to be more enthusiastic when learning media utilises digital devices that are familiar to them.

In addition, the use of Canva to design content also contributes significantly to the visual appeal of the module. Good visualisation can increase attention and learning retention, as stated by Dagys (2017) through the principle of multimedia learning, which emphasises the importance of integrating visuals and text in digital learning. Students assessed that the aesthetic presentation of content is not only attractive, but also facilitates understanding because the information is conveyed in a more organised and communicative manner (Firmanto, 2019)(Mustakim & Jumini, 2020). This further strengthens students' perception that digital modules have both aesthetic and functional qualities.

The use of Kahoot as an interactive quiz is one of the main factors why the software utilisation aspect received the highest score. Kahoot has been proven to increase participation, engagement, and a competitive but enjoyable learning atmosphere (Bidarra & Rusman, 2017). The combination of Google Sites, Canva, and Kahoot creates an interactive, engaging, effective, and efficient digital learning ecosystem. These findings emphasise that the integration of several current software applications greatly supports the learning experience of the digital native generation, thereby enhancing their positive perception of the quality of learning products.

The results of the study indicate that the attractiveness aspect received the lowest practicality score compared to other aspects. Students and lecturers assessed that the content display, which is still dominated by Times New Roman font from PDF files, makes the module appear rigid and outdated. This finding is in line with the research by Lestari et al (2025), which states that typography selection has a significant effect on users' aesthetic perception and comfort in reading digital content. Monotonous visual design tends to reduce learners' interest and attention, especially among the digital generation who are accustomed to modern and dynamic interface displays.

In addition to typography issues, the plain product background without additional visual ornaments also contributed to the low score in terms of appeal. A display that lacks graphic elements such as icons, illustrations, or animations makes the content appear flat and does not provide sufficient visual stimulation to users. This is in line with the principle of visual engagement in learning design theory, where visual elements serve to increase learners' motivation and focus (Bespalova et al., 2016). Without visual variety, digital modules have the potential to fail to create an optimal learning experience.

The absence of attractive colour combinations also weakens the aesthetic aspect of the product. The right colour palette can improve readability, emotional atmosphere, and perception of the professionalism of learning media (Rosenberg & Krist, 2021). If colours are not used strategically, the product can appear monotonous and less interactive, thereby reducing user motivation. Therefore, the low attractiveness score indicates that the visual design of the module needs to be improved through the selection of more modern fonts, the integration of graphic elements, and the

optimisation of colour combinations to make the learning experience more engaging and enjoyable.

Conclusion

The assessment of several experts concluded that the IFTAR digital module has a validity score that falls into the very high (0,90) category. On the other hand, the practicality score based on the lecturers' assessment is in the very high (0,93) category and that of the students is also in the very high (0,92) category.

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Author Contributions

Conceptualization, F.F. and D.D.; methodology, F.F.; software, Z.Z.; validation, F.F, D.D. and Z.Z.; formal analysis, Z.Z.; investigation, Z.Z.; resources, D.D.; data curation, F.F and D.D; writing—original draft preparation, Z.Z.; writing—review and editing, Z.Z.; visualization, Z.Z.; supervision, F.F and D.D.; project administration, F.F.; funding acquisition, D.D.

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Conflicts of Interest

The authors declare no conflict of interest.

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