Handoko E et al., JPKI, 2026;15(1):30-42
doi: 10.22146/jpki.110160

ORIGINAL RESEARCH

Developing an Interprofessional Stunting Prevention Module: an Educational Design Research Study

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Submitted: 7 August 2025, Final Revision: 30 March 2026, Accepted: 31 March 2026

ABSTRACT

Background: Stunting is a major public health issue in Indonesia, with a prevalence rate of 19.8%. Addressing this challenge requires coordinated action across multiple health disciplines, yet educational resources to promote interprofessional collaboration in stunting prevention remain limited.
Aims: To develop an interprofessional education (IPE) module for undergraduate students across five health-related disciplines - medicine, nursing, midwifery, nutrition, and physiotherapy - and evaluate its effectiveness.
Methods: Using an Educational Design Research, the study developed and tested the module through an iterative process. Participants' knowledge and collaboration readiness were assessed using pre- and post-tests and the Readiness for Interprofessional Learning Scale (RIPLS).
Results: Wilcoxon signed-rank tests showed that the IPE module significantly improved students' knowledge about stunting prevention ($p < .001$, $Z = 4.239$, $r = .80$) and readiness for interprofessional collaboration ($p = .016$, $Z = 2.409$, $r = .46$). Thematic analysis of student reflections revealed improved understanding of the roles and contributions of different health professions, better awareness of the value of interdisciplinary collaboration, and an appreciation for community engagement in stunting prevention. Challenges identified included interpersonal and communication issues, time constraints, and overlapping responsibilities among professions. They also provided suggestions for module improvement, such as involving more programs from health and nonhealth disciplines and enhancing content depth.
Conclusion: The study's findings suggest that IPE is an effective tool for equipping future healthcare professionals to address complex health issues such as stunting, and that the approach should be expanded and refined for broader application in health education.

Keywords: Stunting, Interprofessional Collaboration, Interprofessional Education, Stunting Prevention, Module Development

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PRACTICE POINTS

- Interprofessional education (IPE) is an effective approach to teaching complex community health issues to students in health-related fields.
- IPE fosters readiness for cross-disciplinary collaboration among health students by shifting their attitudes and preparedness for team-based care.
- The integration of multiple health disciplines, early scheduling, and embedded reflection activities offers a scalable model for institutions aiming to build IPE modules in resource-constrained settings.
- Participatory and iterative approaches, such as those in educational design research, can improve the effectiveness of IPE initiatives.

INTRODUCTION

Stunting remains a critical public health issue in Indonesia, affecting about 1 in 5 children (19.8%) and jeopardizing the nation's human capital.[1] The World Health Organization (WHO) defines stunting as height-for-age more than two standard deviations below the Child Growth Standards median.[2] If left unchecked, the condition hinders physical growth and impairs brain development, intelligence, academic achievement, and overall health.[3]

Long-term data from an Indonesian cohort study show that stunted children receive two fewer years of schooling due to dropout, start Grade 1 roughly five months later than their non-stunted peers, and score 0.56-0.80 SD lower on adult cognitive tests.[4] Global evidence also confirms that the losses encompass aspects beyond education. Chronic stunting is associated with lower adult wages and productivity, higher risks of chronic diseases (e.g., obesity, diabetes, hypertension, and adverse maternal outcomes), and reduced work capacity.[5] Even worse, when combined with wasting, stunted children are 12 times more likely to die than their healthy peers.[6] The Indonesian government has launched multiple strategies to reduce stunting and address this crisis. Despite a steady decline in prevalence, the nation is still far from its 14% target, which has been pushed back from 2024 to 2029 (Figure 1).

Multiple interrelated factors cause stunting. While inadequate nutrition during the first 1,000 days of life, which begins at conception until the child is two years old, is the primary risk factor for stunting, other factors worsen the condition.[7] According to data from Indonesia's Central Bureau of Statistics, as of March 2023, there were 25.90 million (9.36%) people living in poverty in Indonesia.[8] Family household characteristics, such as low parental income, may limit access to healthy food, decent housing, and quality healthcare services.[7] These conditions increase the risk of malnutrition and make children more susceptible to various infections.[9] Furthermore, maternal education plays a significant role, as lower levels of education have been linked to poor feeding practices and a lack of seeking adequate healthcare services.[10] The combination of these factors makes addressing stunting an arduous task for the nation.

The multifactorial nature of stunting underlines the importance of a multidisciplinary approach to address the various root causes.[11] This approach requires integrating knowledge from multiple fields directly or indirectly related to stunting, such as nutrition, healthcare, education, and social support services, to strengthen the country's effort to reduce stunting. Fighting stunting requires collaboration across multiple professions.[12] The involvement of healthcare workers (doctors, nurses, midwives, nutritionists, and physiotherapists), educators, and community stakeholders with diverse expertise is critical in understanding and mitigating the factors contributing to stunting. Such interprofessional collaboration is essential for comprehensive prevention efforts and long-term improvements in children's health.

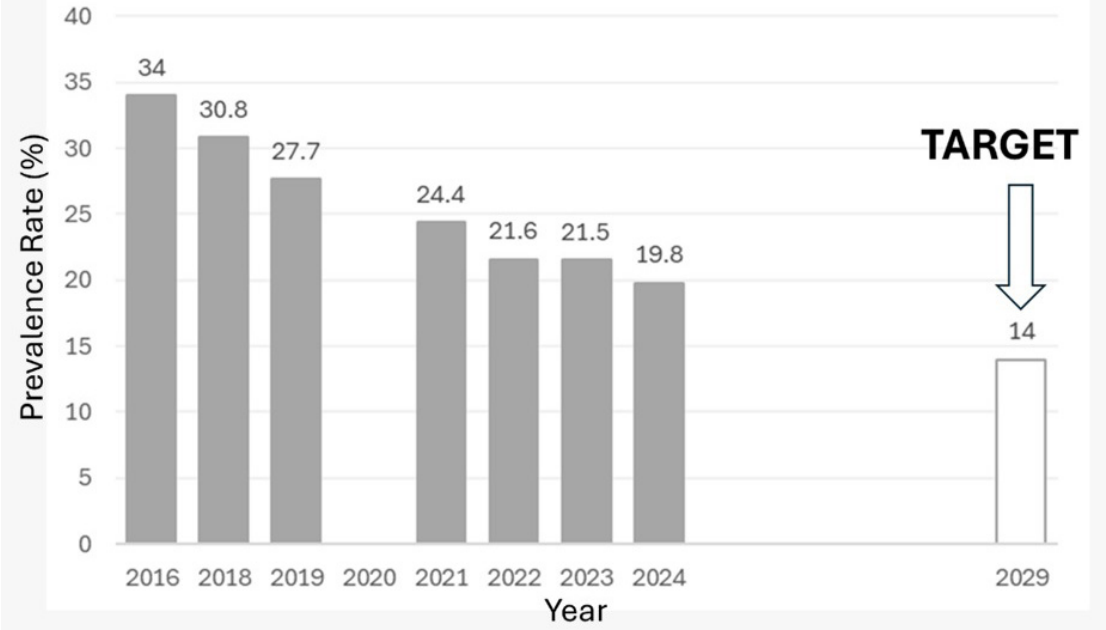

Figure 1. Trends in Stunting Prevalence in Indonesia in the Last Decade

Since stunting determinants span clinical, nutritional, social, and environmental domains, isolated single-profession responses are insufficient. However, most health-science curricula still train students in silos, and the availability of structured interprofessional resources on stunting prevention is limited. The situation highlights the urgent need for innovative educational modules that integrate knowledge from nutrition, healthcare, and the social sciences to prepare better professionals to address stunting in Indonesia. Interprofessional education (IPE) can bridge gaps across fields, fostering shared responsibility, enhancing communication, and promoting collaboration among healthcare teams.[13,14] IPE modules could improve coordination and service integration in tackling stunting.

The primary aim of this study was to develop an interprofessional education (IPE) module tailored for undergraduate students across five health-related disciplines - medicine, nursing, midwifery, nutrition, and physiotherapy - and evaluate its effectiveness by assessing students' knowledge gains and interprofessional readiness after the course. By integrating educational content across disciplines, the module provides a comprehensive approach to stunting prevention. Through a combination of lectures and group discussions, students are prepared to work collaboratively across professions, equipping them with the skills to address the complex issues of stunting in Indonesia.

METHODS

The study participants were fifth-semester undergraduate students from five health-related programs: medicine, nursing, midwifery, nutrition, and physiotherapy. The students from these programs were selected due to the critical roles they would play in stunting prevention, which requires a multidisciplinary approach. The inclusion criteria included: (a) students actively enrolled in the fifth semester of the target program; (b) were willing to complete all learning activities, including the pre- and post-tests. Students on academic leave or on a clinical rotation outside the campus during the study period were excluded. This study was approved by the Research Ethics Committee of Universitas Prima Indonesia under approval number 008/KEPK/UNPRI/VIII/2024.

The methodology of this study followed the three-phase educational design research (EDR) cycle.[15] This research design is a genre of educational inquiry that emphasizes practical, real-world application and iterative refinement of educational

interventions. It was selected due to its unique focus on generating practical outcomes and theoretical insights in academic settings. EDR is particularly suited to addressing complex, real-world problems like stunting prevention, which require multidisciplinary collaboration and the iterative refinement of educational strategies.[16,17] Developing an interprofessional module for undergraduate health students necessitates continuous adjustments and improvements based on feedback from learners and educators, making EDR an ideal framework.[18,19]

The EDR process in this study consists of three main phases: the analysis and exploration phase, the design and construction phase, and the evaluation and reflection phase. Each phase contributes to the iterative development of the interprofessional stunting prevention module (Figure 2). During the analysis and exploration phase, a needs analysis was conducted through a review of stunting data and interviews with faculty members from five different health science programs: medicine, nursing, midwifery, physiotherapy, and nutrition. National survey data indicated that stunting prevalence in Indonesia in 2023 was 21.6%, supporting the need for new educational approaches.

Interviews with subject-matter experts (SMEs) from the five programs revealed a lack of comprehensive, integrated learning materials. Faculty discussions also showed that no structured teaching module aligned with the national curriculum on interprofessional education for stunting prevention. Current curricula in each program do not explicitly address interprofessional education, and learning materials are often not integrated across disciplines. The faculty also highlighted the need to enhance interprofessional and collaborative teaching skills. Furthermore, they identified coordination challenges between various health professions and the lack of training in interprofessional education. The outcome of this phase was Version 1 of the IPE stunting module.

In the second phase of EDR, the design and construction phase, the research team developed the module tailored to the roles of each health profession. The module was then pilot-tested with eight volunteer students. Several revisions to the initial module were made based on the feedback collected during the pilot project. Pilot feedback was gathered through a brief structured debriefing discussion and written comments from participants and faculty facilitators. Some of the revisions included adding a growth-chart reading demo, a simpler role-play activity, and a more realistic interprofessional activity. The outcome of this pilot project was the IPE stunting module version 2.

Scheduling the training activities posed significant challenges due to differences in academic calendars across the programs. The final schedule was set three months in advance, ensuring the participation of students and faculty from the programs in medicine, nursing, midwifery, nutrition, and physiotherapy. The module comprises six topics delivered through lectures, simulations, and group activities to foster interdisciplinary collaboration while ensuring that the material is relevant to each profession.

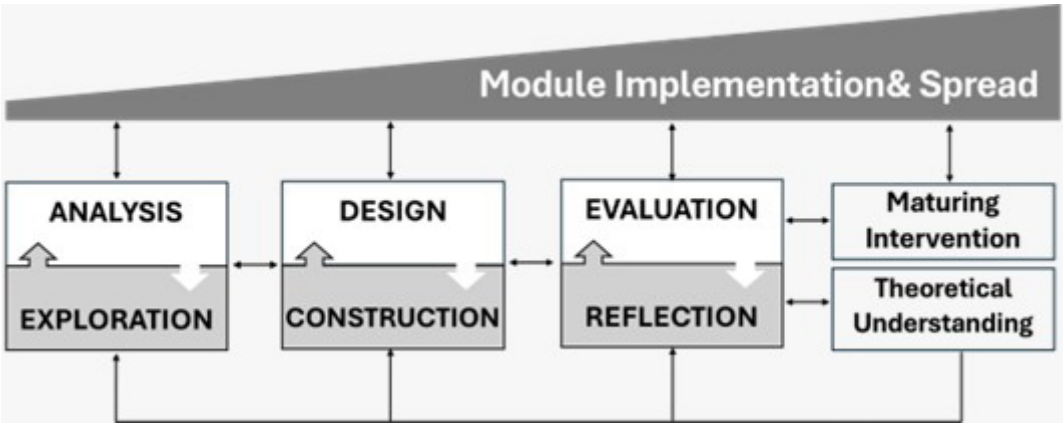

Figure 1. Trends in Stunting Prevalence in Indonesia in the Last Decade

In the final phase of EDR, the evaluation and reflection phase, participants completed post-tests and reflected on their experiences. Reflections were collected immediately after the module using four open-ended questions focusing on benefits, collaboration roles, challenges, and suggestions. This reflection included students' perceptions of interprofessional collaboration and identified areas for module improvement. The results of the evaluation and reflection are discussed in subsequent sections. Phase 3 resulted in the finalized version of the module (Version 3), which was supported by results from the present study, as well as thematically derived feedback that informed the final design principles. A summary of the three EDR phases is presented in Table 1.

Participants were selected using purposive sampling because the study required students from disciplines relevant to stunting prevention. This purposive approach ensured that the sample was appropriate to the interprofessional context of the developed module.[20] Data collection occurred at the designated training site, where face-to-face learning activities and simulations were conducted. The participants received transportation reimbursement to support their attendance at the in-person training sessions. This incentive was provided to ensure that logistical challenges, such as travel costs, did not prevent students from fully participating in the learning activities. No other financial incentives besides transportation reimbursement were provided, and all participants participated voluntarily.

The expected sample size was 30 students, and the actual sample size was 28, resulting in a participation rate of 93.33%. Given the exploratory nature of the EDR method, no formal power analysis was conducted. This sample size was sufficient to generate practical insights, as EDR focuses on iterative testing and refinement rather than large-scale statistical generalization.[15] Based on their academic programs, There were four students in Physiotherapy, six in Nutrition, six in Midwifery, six in Nursing, and six in Medicine (see Table 2).

Three primary outcomes were measured in this study: (1) knowledge about stunting and its management through interprofessional collaboration, measured by a quiz administered before and after participation in the module; (2) readiness for interprofessional learning, assessed using the Readiness for Interprofessional Learning Scale (RIPLS);[21,22] and (3) reflections on the learning process, gathered from students' accounts of their experiences in the module.

Table 1. Summary of EDR Phases in Developing the Interprofessional Module for Stunting Prevention

EDR Phase	• Key Activities
Phase 1: Analysis and Exploration	• Desk review of national stunting data and policy. • Semi-structured interviews with SMEs from five health programs (medicine, nursing, midwifery, nutrition, physiotherapy).
Phase 2: Design and Construction	Prototype: • Designing a draft module with the faculty • Building six key topics Pilot Revision: • Piloted with 8 volunteer students • Rapid-feedback workshop • Revisions: add growth-chart demo, simplify role-play, and add interprofessional collaboration activity
Phase 3: Evaluation and Reflection	• Full implementation over two weekends. • Pre- and post-tests measured students' knowledge gains and readiness for interprofessional collaboration. • An open-ended survey offered students the opportunity to reflect on their collaboration experiences and the module. • Evaluation and reflection results are integrated into module version 3.

Table 2. Participants' Demographics (N = 28)

Academic Program	Male	Female	Count
Physiotherapy	3	1	4
Nutrition	0	6	6
Diploma in Midwifery	0	6	6
Nursing	2	4	6
Medicine	3	3	6
Total	**8**	**20**	**28**

Data were analyzed using a mixed-methods approach, incorporating quantitative and qualitative analyses. For the quantitative data, pre- and post-test knowledge scores related to stunting prevention and interprofessional collaboration were compared. Students' perceived readiness for interprofessional learning was also examined before and after the intervention. Since the data were not normally distributed, a non-parametric test, the Wilcoxon signed-rank test, was used for these comparisons. The qualitative data were analyzed using thematic analysis, beginning with a review of all responses to identify emerging patterns and themes.[23] Initial coding was conducted by grouping relevant parts of the responses into categories based on shared meanings. Responses related to module benefits, collaboration roles, challenges, and suggestions were organized into structured codes. Finally, the researchers identified broader themes that captured the main ideas in the data, using direct quotes from participants to clarify each theme's meaning. Quantitative and qualitative findings were integrated during the interpretation stage, where statistical outcomes were examined alongside thematic reflections to inform the final design principles and module revisions.

RESULTS AND DISCUSSION

Knowledge and Readiness for Interprofessional Collaboration Scores

Student knowledge about stunting and interprofessional collaboration was measured before and after the interprofessional module. The Wilcoxon signed-rank test indicated a statistically significant increase in knowledge scores, with a median of 70.00% before and 93.33% after the module $p < .001$, $Z = 4.239$), and a large effect size ($r = 0.80$). These results demonstrate that the interprofessional module effectively increased students' knowledge of stunting prevention and highlighted the importance of interprofessional collaboration in addressing complex health issues. The median scores for the quantitative data are presented in Table 3. This result aligns with previous research showing the positive impact of interprofessional education on students' understanding of complex health issues, particularly in multidisciplinary settings.[24] Integrating knowledge from different healthcare disciplines, such as Medicine, Nursing, Midwifery, Nutrition, and Physiotherapy, this IPE module allowed students to gain a more holistic view of stunting prevention, addressing both clinical and social determinants of health.[25]

Table 3. Pre- and Post-tests Median Scores for Knowledge and RIPLS (N = 28)

	Median	
	Pre	Post
Knowledge	70.00	93.33
RIPLS	74	81
Teamwork and Collaboration	40	43
Professional Identity	27.5	30
Roles and Responsibilities	9	9

Student perceptions of their readiness for interprofessional collaboration, as measured by the Readiness for Interprofessional Learning Scale (RIPLS), were compared using a Wilcoxon signed-rank test. The test results showed a statistically significant increase in perceptions of readiness for interprofessional collaboration after the module ($Mdn = 81$) compared to before the module ($Mdn = 74$), $p = .016$, $Z = 2.409$, with a medium to large effect size, $r = 0.46$. The results demonstrate a meaningful improvement in students' confidence in their ability to collaborate with peers from other health professions and an increased awareness of the importance of collaboration in stunting prevention.

The analysis was followed up with Wilcoxon signed-rank tests for each RIPLS subscale to compare student perceptions before and after the training. The subscales are Teamwork and Collaboration, Professional Identity, and Roles and Responsibilities.

The Teamwork and Collaboration subscale showed a statistically significant increase in median scores from 40 (before module) to 43 (after module), p = .003, Z = 2.935. Similarly, the Professional Identity subscale also demonstrated a statistically significant improvement, with median scores increasing from 27.5 before to 30 after the module, p = .003, Z = 2.935. These results indicate that the training positively impacted students' perceptions of teamwork, collaboration, and professional identity. However, the Roles and Responsibilities subscale did not show a significant change, with the median score remaining at 9 both before and after the training. The Wilcoxon signed-rank test for this subscale revealed no statistically significant difference, p = .193, Z = 1.303. The lack of significant change in the Roles and Responsibilities subscale may reflect the complexity of clarifying roles in early-stage interprofessional learning. While the participants reported stronger teamwork and collaboration attitudes, as well as professional identity development, defining distinct professional boundaries may require more sustained exposure and repeated practice in authentic settings. This interpretation is supported by the qualitative findings, which show that participants described their overlapping roles as a source of confusion during collaboration.

The positive shift in readiness to collaborate across disciplines suggests that the module effectively prepared students to engage in teamwork within real-world healthcare settings. This finding is consistent with previous studies showing that students exposed to interprofessional education are more likely to develop collaborative skills and understand the roles of different healthcare professionals in patient care.[26] Effective teamwork is critical in managing stunting, influenced by various social, economic, and health-related factors that no single profession can tackle alone.[12,18,27] Therefore, fostering collaborative attitudes early in students' education is essential for preparing them to work in multidisciplinary teams in their future careers.

Student Reflections on the Implementation of the Interprofessional Module

Data on student reflections were collected after the interprofessional module was completed through a series of open-ended questions. The questions focused on four core areas: (1) the module's benefits in enhancing knowledge of stunting prevention, (2) the role of interdisciplinary collaboration in stunting prevention, (3) challenges faced in interprofessional collaboration, and (4) suggestions for module improvement. A total of 21 students provided reflections, which were analyzed using thematic analysis.

Benefits of the Module

Thematic analysis of responses regarding participants' perceptions of the module's benefits revealed that the interprofessional module improved students' knowledge of stunting prevention and instilled an appreciation for the collaborative, community-centered approach necessary to address complex public health issues. Participants consistently reported that the interprofessional module enriched their knowledge and understanding of stunting prevention. They reported that the module enhanced both foundational and expanded knowledge on stunting. For example, one participant stated,

> *"This training was beneficial, especially in the areas of nutrition, prenatal, and child care, as well as in [interprofessional] collaboration" (ID11Q1)*

while another shared,

> *"...greatly increased my knowledge about stunting issues, which is essential for me as a midwifery student to understand what stunting is, how to handle it, and how to prevent it from occurring" (ID21Q1)*

In addition to content knowledge, participants also reported an increased appreciation of the importance of interprofessional collaboration in stunting prevention. They expressed that the module provided valuable insights into the roles and contributions of various health professionals, promoting a deeper understanding of collaborative practice. As one participant noted,

> *"...the most beneficial part was collaborating with other healthcare professionals" (ID4Q1)*

and another stated,

"...I was able to understand stunting and the handling done by each profession, as well as the need for interprofessional collaboration" (ID17Q1)

Participants also highlighted an increased awareness of the role of community education and engagement in stunting prevention. For example, one participant wrote,

"The most beneficial aspect was learning about ways to shift the community's mindset regarding stunting prevention..." (ID07Q1)

The Role of Interdisciplinary Collaboration in Stunting Prevention

The responses emphasized that stunting is a complex issue that cannot be tackled by any single profession. For instance, one participant highlighted,

"...stunting cannot be prevented by only one profession" (ID03Q2)

while another participant noted that,

"Interdisciplinary collaboration is crucial to optimize patient outcomes" (ID04Q2)

This recognition underscores participants' perceptions of shared responsibility and the collective effort required across professions to address stunting.

Participants also became more aware of the distinct roles of other health professionals and how these roles complement each other in stunting prevention. The participants seemed more aware of the unique contributions of their profession to stunting prevention. For example, a midwifery student wrote about conducting

"home visits for early detection and screening of child growth and development..." (ID13Q2)

Another participant, a physiotherapy student, explained their role in

"...providing gross and fine motor stimulation to children" (ID11Q2)

These reflections show that participants not only appreciated the contributions of various disciplines but also understood how each role interlinks to form a comprehensive approach to stunting prevention. One participant summarized it well as

"...each health discipline has its unique capacity to address stunting issues" (ID07Q2)

The Challenges of Interprofessional Collaboration

The thematic analysis of participants' responses also revealed several key challenges that students identified after completing a mini interprofessional collaboration project. The first challenge identified was the interpersonal discomfort and hesitation experienced during group discussions. Participants reported feeling awkward or hesitant when engaging with team members from other study programs, which hindered effective collaboration. One participant noted,

"The challenge is a sense of awkwardness among team members" (ID10Q3)

During an interprofessional collaboration session, differences in opinions and approaches were common, as each profession often had its preferred approach to addressing health issues. As one participant stated,

"...differences in opinion often become a challenge that must be handled wisely" (ID07Q3)

Time management and scheduling also presented a major obstacle to effective interprofessional collaboration. Participants (e.g., ID18Q3, ID17Q3) frequently cited limited time for collaboration and difficulty in synchronizing schedules across different professions. These responses highlight the need for flexible scheduling and alternative communication methods to facilitate collaboration.

Another challenge identified was overlapping responsibilities and confusion. Participants noted that the roles of each profession were not always clearly defined, leading to inefficiencies and misunderstandings within the team. For instance, one participant described,

"… the challenge is caused by the overlapping roles of our professions" (ID03Q3)

Suggestions for Module Improvement

Three main themes emerged from participants' suggestions for module improvement: the inclusion of more professions and perspectives, enhanced content and depth, and consistent, frequent training on other health issues. Many suggested expanding the module to include additional health professions and involve other professionals from non-health sectors. They felt that incorporating a wider range of expertise would enhance the collaborative aspect of the training and provide a more comprehensive approach to stunting prevention. For instance, one participant recommended,

> *"Future training sessions should invite more participants from various sectors, such as the food sector, government, BKKBN, and others" (ID04Q4)*

Another suggested including students from other health fields,

> *"...hopefully, in the future, other programs like Pharmacy will also be invited" (ID05Q4)*

The participants also expressed a desire for more in-depth content on stunting prevention and for increased opportunities for discussion and interaction. One participant stated,

> *"We need to broaden the scope of stunting education" (ID12Q4)*

Others highlighted the need for greater engagement during training and suggested additional time for discussions to foster deeper understanding.

> *"My suggestion is to hold this activity more frequently and allocate more time for discussions" (ID13Q4)*

Additionally, participants expressed interest in gaining more hands-on experience in community engagement to better understand how to educate the public about stunting prevention. This indicates a demand for both theoretical depth and practical application in the training.

Lastly, several participants recommended that the module be conducted more consistently and cover additional health topics beyond stunting. They saw value in using this interprofessional training model to address other significant health issues, as shown in a participant's suggestion.

> *"Activities like this should be held more often to expand students' knowledge on important health topics" (ID21Q4)*

This feedback reflects an appreciation of the module's effectiveness and a desire to see it applied across various areas of health education.

Design Principles for Developing Interprofessional Modules

The Educational Design Research (EDR) approach aims to maximize practical impact and generate new theoretical knowledge. During the EDR process of developing this module, several key design principles for interprofessional stunting prevention modules were identified. These principles are based on the challenges encountered during module implementation and feedback from students and faculty.

Principle 1: Integrating Cross-Professional Perspectives in Module Development

In developing an interprofessional module, each profession brings unique perspectives and expertise. Therefore, it is essential to integrate contributions from each profession across all aspects of the module, from learning materials to discussions. Teaching should allocate equal time for each health profession, such as Medicine, Nursing, Midwifery, Nutrition, and Physiotherapy, so that students from different disciplines can contribute significantly to understanding and addressing stunting. Interprofessional collaboration can be strengthened by providing space for each perspective, enhancing the effectiveness of stunting prevention interventions.

Principle 2: Facilitating Effective Communication and Collaboration Between Professions

Differences in terminology and approaches across professions often create communication barriers. This module should provide practice opportunities for students to understand the roles and language of other professions. By providing sufficient communication training and encouraging cross-disciplinary discussions, students will better understand each

other's roles within the team, thereby reducing common misunderstandings. As a result, collaboration becomes more effective, and interprofessional teams can work harmoniously to prevent stunting.

Principle 3: Accommodating Differences in Student Backgrounds and Knowledge Levels

Students from different programs have varied backgrounds and levels of understanding regarding stunting. To bridge these differences, the module can provide adequate introductory material, especially for those unfamiliar with certain aspects of stunting prevention. This ensures all participants start with a similar foundational understanding, making the learning and collaboration process more effective. This also allows students to learn from one another, increasing cross-disciplinary understanding.

Principle 4: Careful Scheduling to Accommodate the Busy Schedules of Various Programs

Coordinating schedules across different programs is a significant challenge in implementing interprofessional modules. Each program often has its own academic calendar and schedule. Therefore, scheduling should be done well in advance, with flexibility in setting meeting times. In this study, activities were scheduled three months in advance to ensure that students from all programs could participate. Careful planning ensures optimal engagement and minimizes scheduling conflicts.

Principle 5: Providing Opportunities for Continuous Reflection and Feedback

A continuous process of reflection and feedback is essential in interprofessional modules. Reflection allows students to consider their experiences in cross-professional collaboration, while feedback from both faculty and students can be used to improve the module. The iterative process of Educational Design Research (EDR) allows instructors to continuously update content and teaching methods based on feedback, enabling the module to evolve and improve with each iteration.

One of the main barriers to effective interprofessional collaboration, as highlighted by the students, was differences in terminology and professional approaches. These communication challenges are well-documented in the literature on interprofessional education and often stem from the distinct languages and frameworks used by different healthcare disciplines.[19] Without a shared understanding, miscommunications can hinder the effectiveness of collaborative efforts. Addressing these challenges in future iterations of the module through more focused training on interprofessional communication will be critical in ensuring smoother collaboration and better outcomes in clinical and community settings.

The results also suggest that while the module succeeded in the short term, its long-term impact on students' behavior and collaboration in real-world settings remains unknown. Short-term gains in knowledge and collaboration readiness may not necessarily translate into sustained interprofessional practice after students enter the workforce. The lack of long-term follow-up is a limitation of this study, as it prevents us from understanding whether the knowledge and attitudes developed through the module will persist over time. Therefore, future research should aim to evaluate the sustainability of the module's impact by tracking students' interprofessional collaboration skills as they transition into clinical practice.

Study Limitations

Several limitations were identified in this study. First, because participants were recruited through purposive sampling and volunteered, the study is subject to selection bias. Those who participated may have been more academically motivated or more interested in interprofessional learning than non-participants. The absence of random assignment and a comparison group means that unmeasured confounders, such as the students' baseline academic performance or prior exposure to stunting content, may partly explain the observed improvements. While the findings suggest a strong association between participation in the module and improved outcomes, the design does not allow a definitive causal conclusion that the module alone produced these changes. Whenever feasible, future studies should consider using controlled comparisons and random assignment to strengthen internal validity.

Second, the sample size was relatively small, with only 28 students participating in the module. Although the findings are promising, the limited number of participants limits generalizability to the larger population. Future studies should aim to involve a larger and more diverse cohort of students from different institutions to strengthen the external validity of the findings.

Third, the module was implemented within a controlled academic environment, which may not fully reflect the complexities of real-world clinical or community settings. In a classroom or workshop setting, students can focus on structured learning activities without the additional pressures and uncertainties that arise in practice. Therefore, while the module successfully increased knowledge and collaboration readiness in an academic context, it remains unclear whether these outcomes would be replicated in more dynamic and less predictable environments, such as healthcare facilities or community outreach programs.

Lastly, this study only measured short-term outcomes, evaluating students' knowledge and attitudes immediately after the module. There was no follow-up to assess whether the gains in knowledge and readiness for collaboration persisted over time. Future studies should incorporate longitudinal assessments to evaluate the long-term impact of the interprofessional module. The long-term assessments would help determine whether students continue to apply the knowledge and collaborative skills gained from the module as they progress through their education and into professional practice.

CONCLUSION

This study demonstrated that an interprofessional education module can significantly enhance knowledge about stunting prevention and improve students' readiness to collaborate across disciplines. These findings underscore the importance of interprofessional education in preparing future healthcare professionals to address complex public health issues such as stunting, which require coordinated efforts across multiple sectors.

RECOMMENDATION

To further enhance the effectiveness of interprofessional modules, future iterations should expand the module to include a more diverse group of students from different institutions and track the long-term impact of the module on professional behavior in clinical practice. Such efforts will provide a more comprehensive understanding of interprofessional education's role in shaping the future healthcare workforce.

ACKNOWLEDGEMENT

This research was funded by a research grant from the Directorate of Research and Community Service, Indonesia, for the 2024 fiscal year.

COMPETING INTERESTS

The authors declare that there are no competing interests related to the study.

LIST OF ABBREVIATIONS

EDR : Educational Design Research

RIPLS : Readiness for Interprofessional Learning Scale

SME : Subject Matter Expert

AUTHORS' CONTRIBUTION

Erwin Handoko - developing research proposal, collecting research data, analyzing data, and writing the manuscript.

Nelly Dameria Sinaga - developing research proposal, collecting research data, analyzing data.

Martha Sutriska Sagala - developing research proposal, collecting research data, analyzing data.

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Putranto Manalu - collecting research data and analyzing data.

REFERENCES

1. Kementerian Kesehatan Republik Indonesia. Survei status gizi Indonesia SSGI 2024 dalam angka. 2025.
2. World Health Organization. Stunting in A Nutshell 2015. https://www.who.int/news/item/19-11-2015-stunting-in-a-nutshell (accessed April 30, 2024).
3. United Nations Children's Fund. The state of the world's children 2019: Children, food and nutrition 2019. https://www.unicef.org/reports/state-of-worlds-children-2019 (accessed July 11, 2024).
4. Lestari E, Siregar A, Hidayat AK, Yusuf AA. Stunting and its association with education and cognitive outcomes in adulthood: A longitudinal study in Indonesia. PLoS One 2024;19:1-18. https://doi.org/10.1371/journal.pone.0295380
5. Soliman A, De Sanctis V, Alaaraj N, Ahmed S, Alyafei F, Hamed N, et al. Early and long-term consequences of nutritional stunting: From childhood to adulthood. Acta Biomedica 2021;92. https://doi.org/10.23750/abm.v92i1.11346
6. Ministry of Health Republic of Indonesia, UNICEF. Towards a future in Indonesia without child undernutrition: Managing child wasting and reducing the prevalence of child stunting. 2024.
7. Atmojo JT, Handayani RT, Darmayanti AT, Setyorini C, Widiyanto A. Intervensi Gizi dalam Penanganan dan Pencegahan Stunting di Asia: Tinjauan Sistematis. (JKG) JURNAL KEPERAWATAN GLOBAL 2020;5:26-30. https://doi.org/10.37341/jkg.v5i1.90
8. Badan Pusat Statistik. Indonesia Poverty Profile in March 2023 2023. https://www.bps.go.id/en/pressrelease/2023/07/17/2016/indonesia-poverty-profile-in-march-2023.html (accessed July 28, 2024).
9. Rah JH, Cronin AA, Badgaiyan B, Aguayo V, Coates S, Ahmed S. Household sanitation and personal hygiene practices are associated with child stunting in rural India: A cross-sectional analysis of surveys. BMJ Open 2015;5. https://doi.org/10.1136/bmjopen-2014-005180
10. Laksono AD, Wulandari RD, Amaliah N, Wisnuwardani RW. Stunting among children under two years in Indonesia: Does maternal education matter? PLoS One 2022;17:e0271509. https://doi.org/10.1371/journal.pone.0271509
11. Tanoto Foundation. Multi-stakeholder approach is key to reducing stunting in Indonesia. Forbes 2022.
12. Sulistyaningsih S, Aprillia R, Annisa L, Febrianti CP. The Effectiveness of Interprofessional Collaboration Practice to Reduce The Risk of Stunting: An Integrative Review. Jurnal Aisyah : Jurnal Ilmu Kesehatan 2023;8. https://doi.org/10.30604/jika.v8i2.1680
13. Bogossian F, New K, George K, Barr N, Dodd N, Hamilton AL, et al. The implementation of interprofessional education: a scoping review. Advances in Health Sciences Education 2023;28. https://doi.org/10.1007/s10459-022-10128-4
14. Shaw L, Kiegaldie D, Heng H, Morris ME. Interprofessional education to implement patient falls education in hospitals: Lessons learned. Nurs Open 2023;10. https://doi.org/10.1002/nop2.1276
15. Susan McKenney, Thomas Reeves. Conducting Educational Design Research. 2nd ed. Routledge; 2018.
16. Barab S, Squire K. Design-Based Research: Putting a Stake in the Ground. Journal of the Learning Sciences 2004;13:1-14. https://doi.org/10.1207/s15327809jls1301_1

17. Susie L Gronseth, Erwin Handoko, Sara McNeil, George Zhao, Haoyue Zhang, Bulent Dogan. Gamifying an Online Instructional Design Course: An Educational Design Research Study. AECT, Las Vegas: 2019, p. 79-91.
18. Guraya SY, Barr H. The effectiveness of interprofessional education in healthcare: A systematic review and meta-analysis. Kaohsiung Journal of Medical Sciences 2018;34. https://doi.org/10.1016/j.kjms.2017.12.009
19. Hall LW, Zierler BK. Interprofessional Education and Practice Guide No. 1: Developing faculty to effectively facilitate interprofessional education. J Interprof Care 2015;29. https://doi.org/10.3109/13561820.2014.937483
20. Reales Chacón LJ, Robalino Morales GE, Peñafiel Luna AC, Cárdenas Medina JH, Cantuña-Vallejo PF. Non-probabilistic intentional sampling: a scientific research tool in health science careers. Universidad y Sociedad 2022;14
21. Parsell G, Bligh J. The development of a questionnaire to assess the readiness of health care students for interprofessional learning (RIPLS). Med Educ 1999;33. https://doi.org/10.1046/j.1365-2923.1999.00298.x
22. Tyastuti D, Onishi H, Ekayanti F, Kitamura K. Psychometric item analysis and validation of the Indonesian version of the Readiness for Interprofessional Learning Scale (RIPLS). J Interprof Care 2014;28. https://doi.org/10.3109/13561820.2014.907778
23. Stephanie Riger, Rannveig Sigurvinsdottir. Thematic Analysis. In: Leonard A Jason, David S Glenwick, editors. Handbook of Methodological Approaches to Community-Based Research, OxfordUniversityPress; 2016, p. 33-41.
24. Zenani NE, Sehularo LA, Gause G, Chukwuere PC. The contribution of interprofessional education in developing competent undergraduate nursing students: integrative literature review. BMC Nurs 2023;22. https://doi.org/10.1186/s12912-023-01482-8
25. Hossain M, Choudhury N, Adib Binte Abdullah K, Mondal P, Jackson AA, Walson J, et al. Evidence-based approaches to childhood stunting in low and middle income countries: a systematic review. Arch Dis Child 2017;102:903-9. https://doi.org/10.1136/archdischild-2016-311050
26. D'Costa MP, Jahan F, Al Shidi A. Health professions students' attitude, perception, and readiness toward interprofessional education and practice in Oman. J Taibah Univ Med Sci 2022;17. https://doi.org/10.1016/j.jtumed.2021.10.004
27. Fitriahadi E, Suparman YA, Silvia WTA, Wicaksono G K, Syahputra AF, Indriyani A, et al. Meningkatkan Pengetahuan dan Kesadaran Tentang Stunting Sebagai Upaya Pencegahan Terjadinya Stunting. Jurnal Masyarakat Madani Indonesia 2023;2:410-5. https://doi.org/10.59025/js.v2i4.154