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Application of the Precede-Proceed Model: A Glimpse into Student-Led Community Health Program in Malaysia.

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ABSTRACT:
Empowering the community through health promotion programs is an integral part of undergraduate medical students' training in Malaysia. Medical students' engagement with the community aligns with efforts to achieve Sustainable Development Goal 2 (Education) and SDG 3 (Health). The Precede-Proceed Model is a comprehensive framework for planning and evaluating health programs. This article showcases the application of this framework in a program conducted by medical students from Universiti Teknologi MARA in Sabak Bernam, Malaysia. Within four weeks, students, guided by lecturers, designed a health promotion program that includes community profiling, health survey, health education materials, media outreach and health talks culminating in a health carnival day. Through community profiling and health surveys under the 'Precede' component, students identified health needs unique to the community, tailoring to elderly residents with non-communicable diseases. The theme "Holistic Health: Healthy Family, Peaceful Community "conveys that individual health contributes to the vitality of the entire community. The 'Proceed' component enables students to conduct evaluations at the process, impact and outcome level. The evaluation process is often overlooked; hence, with the use of this framework, students can be aided in conducting comprehensive future public health programs in support of SDGs 2 and 3.

Keywords: student-led, community empowerment, health promotion programs, Precede-Proceed Model.

1. Introduction

Community engagement by medical students is a crucial part of the undergraduate training, practised in the medical program curriculum in Malaysia (Minhat & Mat Din, 2019). The Public Health Medicine (PHM) posting is being conducted for four weeks among year 4 students in the medical program curriculum at Universiti Teknologi MARA (UiTM). The aim of this posting includes applying public health knowledge to identify community health needs, utilising epidemiological principles for disease prevention at the district level, conducting and analysing research on health issues, and planning and evaluating health promotion programs. Aligning with Service-Learning Malaysia – University for Society (SULAM), these learning objectives foster students' engagement with the community and enhance their practical understanding of public health practices via hands-on experience. Not only are these students given early exposure in honing their communication skills, but pertinently, similar community posting has been shown to instil

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teamwork, leadership and professionalism before they graduate as medical doctors (Minhat & Mat Din, 2019)

Yearly, these undergraduate students are guided by lecturers to design a health promotion program within the four weeks of posting. The week usually began with a student and community meeting to conduct community profiling and assess health needs in the local context. This is followed by a community health survey as part of the research component of this posting. Subsequently, the students and the community will determine a theme, tailored to the health concerns highlighted. The selected theme anchors the content of the health education and health promotion materials, which will then be disseminated through various publicity activities and platforms, as a strategy to culminate anticipation for the carnival day. Finally, in the last week of the posting, students are expected to present their outcome and produce a comprehensive report to elucidate their findings, evaluation and experience.

Previously, students during this posting were introduced to the application of the behavioural change model and theories such as the Health Belief Model as their guiding theories for the development of the education and health promotion materials (Mat Ruzlin et al., 2021) Yet, little is known of the application of the Precede-Proceed Model (PPM) framework in the context of this public health undergraduate posting. The PPM provides a comprehensive health promotion program planning framework that extends beyond interpersonal individual beliefs, such as those embedded in HBM. This systematic approach enables students not only to design culturally specific interventions but also to incorporate feedback and outcome evaluations, making it particularly valuable for undergraduate community health education postings.

2. Precede-Proceed Model (PPM) framework

A plethora of community-based health programs have been conducted based on various behaviour-change models and theories (Alamer, 2024; Nutbeam, 1996). Among the models and theories that enlighten us on the reasons and methods for one's change of behaviour are the health belief model (HBM), the Stages of Change or Transtheoretical Model (TTM), Social Cognitive Theory, the Theory of Planned Behaviour, the Health Promotion Model and the Ecological Model (Alamer, 2024; Mat Ruzlin et al., 2021; Nutbeam, 2000; Zewdie et al., 2022). While these behaviour-change models and theories serve as a means to guide and fortify feasible solutions to public health problems, a planning model distinctly differs from these theories (Crosby & Noar, 2011). The Precede-Proceed Model (PPM) is widely used as a guide in the planning of a health education and promotion program (Green & Kreuter, 2005; Kim et al., 2022). The PPM consists of two parts, which include the planning and evaluation components. PRECEDE refers to **P**redisposing, **R**einforcing and **E**nabling **C**onstructs in **E**ducational or Environmental **D**iagnosis and **E**valuation, whereas PROCEED is the acronym for **P**olicy, **R**egulatory and **Organisational C**onstructs in **E**ducational and **E**nvironmental **D**evelopment corresponding to the steps as portrayed in Figure 1 (Crosby & Noar, 2011; Green & Kreuter, 2005).

Over the years, more research on the application of the PPM framework has evolved to suit its application in the development of health programs (Bammann et al.,

2021; Crosby & Noar, 2011; Glanz et al., 2008; Green & Kreuter, 2005; Kim et al., 2022). From the classic 9 steps by Green & Kreuter (2005), the genetic component was added, and epidemiological assessments were combined with the behaviour and environmental assessments, making it into just 8 phases/steps (Glanz et al., 2008; Green & Kreuter, 2005). A recent review had adapted the PPM and modified it with an inclusion of new terms for each step to illustrate better the way PPM is being put into action (Bammann et al., 2021). Research applying the PPM framework for the development and planning of health promotion programs depicts positive results in the attainment of the intervention outcome (Kim et al., 2022; Mazloomymahmoodabad et al., 2014). This paper aims to review the implementation of a community health-based program from the perspective of this PPM framework to affirm its application with the existing structure of the year 4 public health posting in our institution. Subsequently, understanding the strengths and limitations of its application serves as a basis for future innovation of lecturers' pedagogy and improvement in the conduct of health programs for the benefit of the students and the community.

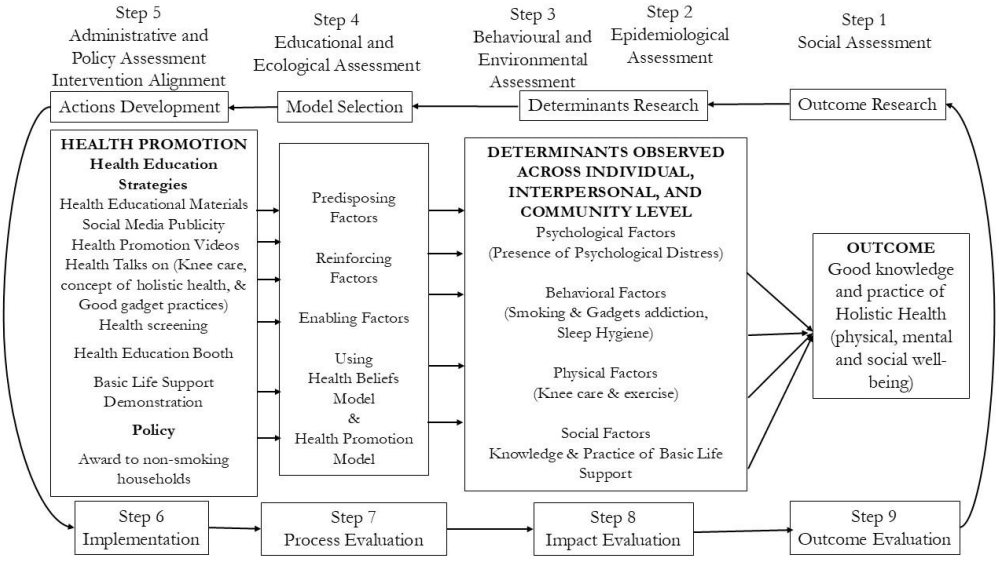
3. Methodology

This article reviewed the planning, implementation and evaluation of a community health-based program conducted by medical students from Universiti Teknologi MARA in a rural community in Sabak Bernam, Malaysia, in October 2024. We had analysed the planning and evaluation of this program in the context of the 9 steps outlined in the classic PPM framework (Green & Kreuter, 2005) and incorporated the modified PPM (Bammann et al., 2021) as shown in Figure 1. Our review applied Bammann's (2021) modified version in view of the improvements shown in step 2, in which determinants were interpreted in a broader context, thus allowing for wider application of contemporary theories and models, beyond just the behaviour-change model. Bammann's (2021) modified PPM provided a broader context of Health Promotion activities based on the Ottawa Charter (World Health Organization, 1987).

The World Health Organisation (WHO) definition of health is not merely the absence of disease but a state of complete physical, mental, and social well-being, underscoring a holistic view of health. In rural areas, even this understanding of the true concept of holistic health is limited (Baccolini et al., 2021; Mursa et al., 2024). Poor health literacy is also closely associated with higher rates of adverse health outcomes (Urstad et al., 2022). By addressing the interplay between physical, mental, and social health, targeted interventions can improve access to healthcare, mental health resources, and community cohesion, ultimately leading to a healthier quality of life for individuals in rural areas. In October 2024, 40 medical students planned and implemented a vibrant health promotion event to inculcate an understanding of holistic health within the community. This initiative was designed to bring together families and individuals to explore the multifaceted dimensions of health and wellness. The theme "Holistic Health: Healthy Family, a Peaceful Community" underscores the importance of collective well-being, highlighting that the health of individuals contributes to the vitality of the entire community. The theme reflects

the integration of cultural, spiritual, and health values that are deeply embedded among the target population. Religious institutions such as mosques and *surau* often serve as

Figure 1. Application of the precede-proceed model in the student-led health promotion program "holistic health: healthy family, peaceful community". Adapted from Green (2005) and Bammann (2021).



central hubs for both spiritual and social gatherings. These facilities are also utilised for community health outreach activities, as they can enhance both accessibility and trust. For instance, mosque-centered health talks or family-based health screenings after Friday prayers align with the community's social norms and values. Embedding health promotion efforts within culturally familiar platforms ensures that interventions are not only visible but also impact an individual's daily life in changing their health behaviour. The application of each step in this model, described by the task, the weeks, the methods of implementation and the yielded outcomes, is summarised in Table 1. Students' and the lecturer's engagement and implementation of this program with the community adhered to the ethics approval obtained from the Research Ethics Committee of Universiti Teknologi MARA (UiTM) with the reference number of REC/07/2024 (ST/MR/134).

Table 1: The adaptations and application of the precede-proceed model in the student-led health promotion program "Holistic health: healthy family, peaceful community"

Step*/Week	**Task**	**Methods of implementation**	**Outcomes in the context of this program.**
Step 1: Social assessment Week 1	1. Conduct of community profiling and community health needs assessment. *	- Student and the community meeting at the local mosque - Informal talks and discussions with key informants	1. Sociodemographic profile: - Mainly elderly, male, Malay and unemployed. - Most self-employed residents are involved in agriculture.

	2. To determine the outcome definition. $		from the community, including committee members of the local mosque and village council, school headmasters, community youths, residents, staff of the city council and the nearest health district office. - Literature Research - Walkabouts and documentations of all the streets, houses, infrastructure and facilities in the village.	2. The men and women had different health concerns, as follows: - Men's issues: ways to quit smoking, prevention and control NCDs, psychological distress, poor health-seeking behaviour. They requested more information on prostate disease and care. - Women's issues: Knee problem. Fewer physical activities. - Common issues: Lack of physical activities, lack of access to health facilities and information. Gadget addictions across all ages. 3. Proposed Outcome: - Theme: Holistic Health: Healthy Family, Peaceful Community. - Improve knowledge and practice of 'holistic health' comprising mental, physical and social/spiritual health among community members.
Step 2: Epidemiological assessment Week 3 & 4	1. Create measurable, time-limited, health-related objectives. * 2. To identify the research determinants $	-	Cross-sectional health survey using self-administered questionnaires	1. 382 residents participated in the survey. 2. The tools covered on the following: - Sociodemographic factors. - Presence of comorbidities: Diabetes, HTN, Dyslipidaemia, - Physical factor: physical activity - Environmental factor: heat strain - Social factors: family function, social support, and health literacy.

				- Behavioural factors: Smartphone, E-cigarette health-seeking behaviour, cancer seeking treatment, sleep quality.
Step 3: Behavioural and Environmental assessment Week 2	1. Identify key environmental and behavioural factors; these will become sub-objectives that direct planning for intervention activities*	- Student-community series of discussions. - Student-student discussions (Health Promotion and Research Proposal Preparation) - Student-lecturer discussion (Health Promotion and Research Proposal presentation)	A few broader determinants were selected and targeted to achieve the program outcome in Step 1 as below: 1. Psychological Factors: - To address psychological distress. 2. Behavioural Factors - Smoking. - Good gadget practices. - Good sleep hygiene practices 3. Physical Factor: - Good practices and physical exercise for knee care. 4. Social Factor: - To improve health literacy on basic life support (BLS) knowledge and hands-on practical.	
Step 4: Educational and Ecological Assessment Week 2 Week 3 Week 4	1- Develop a unique plan to achieve each sub-objective from step 3; Consider predisposing, reinforcing, and enabling factors, and use theory * 2- Behaviour Change Theories/Models selection§	- Student & community series of discussions. - Student: health education and health promotion development on various platforms. - Preparation of the speakers' invitation letters.	1. 3 Speakers identified to deliver 3 different topics. 2. Design and development of flyers, posters, banners, health messages in social media platforms, education materials, a booklet, a flipchart and planning of activities at the educational booth during the health carnival day on the following: - Holistic Health Concept - Mental Health Care - Impact of Smoking on Life - Guide and tips on gadget use - Guide and tips on good sleep hygiene	

					- Guide and tips on knee care & exercise. - Demonstration and hands-on practical on Basic Life Support. 3. Health Beliefs Model and Health Promotion Model selected.
Step 5: Administrative and Policy Assessment Week 2,3,4	1- Assess capacity and resources available to implement programs and change policies such that step 4 sub-objectives can be met* 2- Action Development[$]		- Same as Step 4 - Preparation of the collaboration letters.		1. Collaboration and sponsorship from the mosque committee members in terms of provision of carnival site and tent, chairs and tables, exhibition board and food. 2. Provision of health screening materials and human resources from the district health office. 3. Dissemination of information on the existing Program at the District Health Office for a smoke-free home plaque awarded to households that fulfil the criteria.
Step 6: Implementation Week 3,4	1. Draft and finalise the program evaluation plan before program implementation[*$]		- Student & community series of discussions. - Student Onsite promotion. - Student Online promotion. - Student & Supervisor discussion.		1. Posting on Social Media Platform (WhatsApp, TikTok, Instagram and Facebook) - Health Educational Materials - Program Publicity Materials - Health Promotional Videos - Health Carnival Promotional Video 2. The health carnival day activities: - Community registration - Student-led exercise. - Basic Life Support demonstration. - 7 Stations of Health Education Booths. - Ongoing Health Screening 3. Health talks before the health carnival for women,

				4.	and one is before the Friday prayers for the men. Participants: 212 residents, 40 students, 5 lecturers.
Step 7: Process Evaluation Week 3,4	1.	Monitor the program to ensure fidelity to program blueprints. Provide corrective feedback where changes are needed*$	- Secretary's record-keeping - Treasurer's record-keeping - Google Drive link for common information sharing and record-keeping.	1. 2. 3. 4. 5.	Documentation of all activities from week 1 to week 4. Task checklist Record of the health promotion dissemination timeline Financial account keeping. List of participants for each activity.
Step 8: Impact Evaluation Week 4	1.	Assess whether behavioural and environmental sub-objectives (developed in step 3) were met*$	- The community's evaluation: Using pre- and post-questionnaires on their understanding of the holistic health concept. - Students' evaluation: pre- and post-assessment on teamwork, leadership skills, and knowledge.	1. 2.	112 respondents from the community. The overall conclusion of the statistical analysis across all four domains—physical, mental, emotional, and social health—shows a significant improvement in participants' knowledge, with p-values consistently below the 0.05 threshold. 40 students completed the assessment. There is a significant increase ($P < 0.0007$) in the students' overall total score, which assessed their teamwork, knowledge, leadership, time-management, communication and creative skills.
Step 9: Outcome Evaluation	1.	Assess whether the program had its intended public health impact*$	- This program did not include a control-trial intervention design, as this was beyond the focus of the research project, and the conduct of health promotion programs is part of the year 4 public	Not available.	

		health medicine posting. - We only conducted pre-post assessments as in Step 8.

*Adapted from Green, L. W., & Kreuter, M. W. (2005). *Health program planning: An educational and ecological approach* (Vol. 4). McGraw-Hill, New York. $Adapted from the modified PPM by Bammann et al, 2021

4. Outcomes

This section delves deeper to discuss the strengths and limitations of the outcomes in Table 1 observed in this implemented health promotion program from the perspective of the nine steps outlined in the Precede-Proceed Model. Some steps were reviewed and noted as strengths, and some were addressed under limitations and presented in no order.

4.1 Strengths

Step 1 Social Assessment: The first student-community meeting was conducted at the village's local mosque. The meeting involved fifteen students, three lecturers and approximately fifteen representatives from the community who were committee members of the mosque, local leaders, principals from a nearby school, as well as other committee members of the village. During the discussion with the community members, students were able to delve deeper into the health-related issues and main health concerns within the community. It was interesting to note that the men and women had different concerns, as summarised in Table 1. Expanding the student's understanding of the community's health needs can be manifested through focus group discussion, informal discussion with the members, surveys and observations (Glanz et al., 2008). The first student and community meeting were held at the local mosque and led by the mosque committee members. Two notable advantages to this step are demonstrated by the commitment of the community leaders to link our students with the community through the mosque and allowing students to use the facilities at the mosque as the students' place of *rendezvous* throughout the 4-week posting. Culturally in Malaysia, gatherings and community activities are centred around the mosque as it is usually frequented by the community, especially the men, performing their five daily prayers in congregation. Notably, most of the population in this community were retired Muslim elderly men, making the mosque a strategic dissemination point for health education content and health promotion activities. Second strength is seen through the cultivation of leadership and communication skills enhanced by this student-led engagement, as students take roles as project managers, bureau leaders, alongside program committee members selected from the community. This fosters a stronger partnership between the students and community members to garner a more effective, well-sustained program (Glanz et al., 2008)

Step 3 Behavioural and Environmental Assessments: The three health topics chosen were deliberately planned to address the women and men in the community separately. For the women, the topics were on knee care and gadget control: tips for

parents and children, which were selected to address the concerns expressed by most of the women during the community needs assessment in the first week. As for the men, the health expert was privileged to address almost all the men in that village, as a slot was provided for him just before the congregational Friday prayer, customary to the Muslim majority population. The health message conveyed to all the men of the community encompasses subtopics in cultivating the community towards holistic health, which should begin in the basic unit of a family on good health practices to prevent NCD, such as diabetes, hypertension and poor psychological and mental health issues. Based on mixed findings yielded on the gender identified as predictors for limited health literacy, which mostly came up with recommendations for customised health programs attuned towards the identified group of people (Abdul Karim, 2020; Khozanatuha et al., 2023; Mazloomymahmoodabad et al., 2014; Mursa et al., 2024; Nurjanah & Mubarokah, 2019; Xie et al., 2019)

Step 6 Implementation: Health talks conducted before the health events were part of the strategy to heighten the community's anticipation of the health carnival. Physical encounter between the students, health care providers, and the community has been shown in other studies as the preferred and effective means of attaining health information among the rural population (Abdul Karim, 2020; Nurjanah & Mubarokah, 2019). Likewise, this community appreciated the live sessions as similar participants who attended the health talks were recorded to have attended the carnival too.

Step 7 Process Evaluation: On the health promotion and publicity, the scheduled timing set for each blast of promotion in social media such as Facebook, Instagram, TikTok and through the WhatsApp message has allowed for a consistent, repetitive enforcement of the message. During the posting, students kept abreast of the schedule template of their time to disseminate health information and kept a record of the feedback, such as the number of likes, the replies and the comments captured. This practice of step 7 on process evaluation enabled the students to make decisions if they needed to intensify their publicity as they approached the health carnival day. This is probably attributed to the repetition of topics that were planned under Step 6 to be repeated and conveyed through different methods within the 4-week posting; from the health education posters disseminated through social media, to the health talks before the health carnival culminating in the health carnival day. During the carnival day, the topics were delivered through interactive activities tailored to suit different ages, such as fun games for the kids, live Basic Life Support demonstrations at the health education booths.

Step 8 Outcome evaluation: the students had prepared a pre-and post-question on the knowledge of holistic health and the subtopics imbued under this theme program, such as smoking, sleep hygiene, mental health, knee care, and basic life support. There is an improvement in the knowledge. These findings, as an outcome of adapting the PPM framework, affirm the understanding that a person with improved knowledge is inclined to practice a good, healthy lifestyle (Bammann et al., 2021; Kim et al., 2022). Commonly, in previous research, health knowledge was measured in terms of health literacy, which had been proven to have a significant association with good personal hygiene practices (Nurjanah & Mubarokah, 2019) and preventive measures such as vaccine uptake (Guclu et al., 2019).

4.2 Limitations

Step 2 Ecological Assessments: Despite the conduct of the student and community meeting, providing a general idea of the community profile and their health needs, nonetheless, the significant determinants cannot be identified at the beginning of the public health posting. The current practice in our public health posting allocates the health survey to be conducted by students in the third week. Ideally, application of PPM would allow for the relevant determinants to be identified by the students (Steps 1 and 2), guiding the selection of appropriate behaviour change models or theories to be incorporated in the development of health promotion activities, tailored to elicit specific behaviour action, based upon the intended health outcome (Glanz et al., 2008). The health survey would yield more empirical findings to underscore the determinants suited to address the health concerns under the program outcome. For example, in this program, which focuses on instilling the community's understanding of holistic health, giving ample time to conduct and analyse the health survey for the determination of the significant factors would help students be more focused on the targeted factors. Instead, in this program, students guided by the findings of step 1 had opted to cover a range of factors as depicted in step 3, Table 1. This also made it difficult when moving to step 4 for the selection of the appropriate models or theories, as there were too many factors to match different models, thus compromising the development and execution of the health promotion strategies.

Despite this limitation, we acknowledge that the theme chosen by this group of students on holistic health bears the intention to cover the physical, mental, and spiritual health, which may explain the reason for having several determinants to fulfil the health outcome that splits into 3. Program planners optimising the PPM framework would reap more benefit when the health concern or intended health outcome is more focused, as proven by previous studies (Bammann et al., 2021; Crosby & Noar, 2011; Ghaffari et al., 2021; Mat Ruzlin et al., 2021).

Step 9 Impact Evaluation: As the health promotion program provided is for undergraduate medical students' training, the health education disseminated under the program is not conducted through the empirical methodology of a controlled-trial intervention study; hence, we are unable to demonstrate the effectiveness of each intervention. A study showed that the creation of promotional videos proposing solutions to health problems yielded a positive effect, encouraging the intention to change one's behaviour (Sallam et al., 2022). In our program, the short videos that were produced and disseminated were only measured in terms of the community's interaction with them and not on their effect on their behaviour. This is due to the concise 4-week posting period impeding students' ability to measure the long-term effect of these health promotion videos on the community's behaviour. Generally, most public health intervention programs may need more than 6 weeks to capture improvement and have multiple points of assessment to account for positive impact on behaviour change (Wan Mohamad Darani et al., 2024). The absence of a control group precludes causal inference on behaviour change; hence, future improvements would benefit from adopting quasi-experimental designs with consideration of posting extension, thus allowing for a more rigorous assessment of the program's impact on the community.

5. Implications and recommendations

Our findings resonate with the discussion by Crosby, highlighting the PPM framework as a comprehensive planning and evaluation blueprint, which embeds behaviour change models and theories put into practice to achieve the intended outcome (Crosby & Noar, 2011). While the link between knowledge and health practices is acknowledged in this review, reflecting these results within a wider health literature unfolds the nuanced influence of contextual and cultural factors. The adaptability of PPM across diverse settings, ranging from the rural community as shown in this study, from the Western Asia suburban setting (Barasheh et al., 2017) to the European context (Bammann et al., 2021) covering various health concerns, with different intervention strategies (Kim et al., 2022) indicates the model's flexibility and the importance of customising its implementation to local needs.

Commonly, from the previous commencement of our undergraduate public health program, students have been enlightened and guided on incorporating behaviour-change models and theories such as the Health Belief Model when planning for the objectives to be achieved based on the theme for the health carnival day (Mat Ruzlin et al., 2021). The outcome of this review elucidates that the public health structure itself aligns well with the overall planning and evaluation framework featured in the PPM roadmap, as other theories are also being embedded in this planning model. The above discovery may contribute to the future improvement of our public health program and be adapted by other universities' undergraduate public health curricula. By incorporating knowledge and the application of the PPM framework, lecturers underscore its distinct role as the overall blueprint for any health promotion program, whilst introducing the other behaviour-change theories as being inclusively applied accordingly, within the PPM framework. This can be part of the introductory lectures in the first week of the year 4 PHM posting. Students, being cognizant of this PPM application in the running of their overall 4-week public health program, can help them to delineate aims for each week of their activities and assess the projected outcomes based on the 9 steps outlined. Students can form a checklist as featured in Table 1, thus allowing better monitoring by the lecturers, too. When the student explicitly links each phase structure via this checklist with their project management, onsite, this would accentuate the dual benefits of embedding PPM in the undergraduate training for both the students and the community.

Furthermore, future improvements for the PHM posting could benefit from the rearrangement of activities, such as conducting a health survey earlier in the posting instead of in week 3, to enable aligning step 2 (Epidemiological Assessment) with initial planning in Phase 1, as recommended by PPM. This would enhance model fidelity, subsequently ensuring the development of data-driven interventions. Mindfully applying this PPM planning model as part of the training for undergraduate medical students would profoundly improve the overall organisation of implementing health promotion programs, benefiting not only students and lecturers, but most pertinently, the community members.

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