

# BMJ Open Expert consensus on core topics of sustainable development online learning module for family physicians: a Delphi study

Krishna Suvarnabhumi <sup>1</sup>, Sujitra Jorajit,<sup>2</sup> Wan Dechpichai,<sup>2</sup> Jarus Ativitthayaporn<sup>2</sup>

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<sup>1</sup>Faculty of Medicine, Prince of Songkla University, Hatyai, Songkhla, Thailand

<sup>2</sup>Faculty of Education and Liberal Arts, Hatyai University, Hatyai, Songkhla, Thailand

**Correspondence to**  
Krishna Suvarnabhumi;  
[krishna.s@psu.ac.th](mailto:krishna.s@psu.ac.th)

## ABSTRACT

**Objectives** Medical institutions must provide learning experiences that enhance the knowledge and perspectives of sustainable development (SD) to prepare trainees of family medicine to become competent global citizens. The aim of this study was to develop an SD online learning module for trainees of family medicine.

**Design** This mixed-methods study was conducted from January 2020 to May 2021, beginning with a literature review concerning Sustainable Development Goals (SDGs) and Education for Sustainable Development in medicine. In-depth interviews were held to assess the relevant needs of family medicine training, followed by a two-round Delphi survey with experienced educators (N=21) in family medicine to refine and achieve consensus on the appropriate SDG topics for family physicians.

**Setting** All residency training programmes in Thailand.

**Participants** Members of the Residency Training Committee, Royal College of Family Physicians of Thailand.

**Results** The literature review and in-depth interviews identified 12 topics of SD that were required for family physicians. The first round of the Delphi survey was concluded by identifying seven core topics with additional suggestions. In the second round, a consensus was obtained among the experienced educators regarding seven core topics as (1) a definition of SD, (2) principles of SD, (3) SDG, (4) a new concept of SD, (5) SD in the context of Thailand, (6) SD and principles of family medicine and (7) SD and family practice. These core topics were grouped within three main objectives and three submodules.

**Conclusions** An online learning module of SD for family physicians was developed using modified Delphi method. This included three submodules as (1) concept and principles of SD, (2) SDG and (3) SD and its integration with family practice. This online learning module will provide additional resources for trainees of family medicine and Thai family physicians to expand their knowledge and perspectives of SD.

## INTRODUCTION

Literature concerning global health has grown exponentially, with academic institutions exploring the scope of their public health education programmes to meet the demand of health professionals.<sup>1</sup> Global

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This mixed-methods study developed core topics of sustainable development as an online learning module for family physicians.
- ⇒ High response rates were recorded by the Delphi study as 100% for the first round and 90.5% for the second round.
- ⇒ The study did not include needs or opinions from trainees of family medicine.

competency is essential for young people to succeed and ultimately support the achievement of the Sustainable Development Goals (SDGs).<sup>2</sup> SDGs are the global goals adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet and ensure that by 2030 all people enjoy peace and prosperity. The 17 goals cover global challenges that are crucial for the survival of humanity.<sup>3</sup>

Education is crucial for the achievement of sustainable development. However, not all forms of education support sustainable development. Education for Sustainable Development (ESD) empowers students to make informed decisions and adopt responsible actions for environmental integrity, economic viability and to develop a just society for present and future generations.<sup>4</sup> In the UK, the Royal College of Physicians stated that sustainability is one of the key quality issues.<sup>5</sup> Future doctors must prepare for leading roles in providing sustainable health services. Moreover, the Medical Council proposed that medical schools should move towards sustainable health and quality improvement.<sup>6</sup> Developmental issues of sustainability and sustainable health services are not clearly stated in the Thai National Curriculum of Family Medicine that only mentions health promotion and disease prevention.<sup>7</sup>

To prepare trainees of family medicine with the competency to become global citizens, medical institutions must provide learning experiences that enhance and expand the knowledge and perspectives of sustainable development. Currently, blended learning combining face-to-face class-based methods and online learning is well accepted. These teaching methods allow trainees to progress at their own pace.<sup>8</sup> This study developed an online learning module of sustainable development for trainees of family medicine.

## METHOD

### Study design

This mixed-methods study began by conducting a literature review concerning the applications of SDGs and ESD in medical education. In-depth interviews were also held to assess the relevant needs of family medicine training. The Delphi technique was employed, using experienced educators to determine appropriate topic regarding sustainable development for family physicians.

### Setting and participants

Experienced educators were selected from all residency training programmes who were members of the Residency Training and Board Examination Subcommittee of the Royal College of Family Physicians of Thailand. All of them must older than 35 years old and had more than 10 years teaching experience in family medicine. They were chosen from the training institution representatives throughout Thailand.

### Patient and public involvement

No patient involved.

### Data collection and analysis

#### Literature review

To develop initial concepts of sustainable development to present to family medicine educators, comprehensive search was conducted from core bibliographic databases. These databases recommended by BEME Guide No.3: Systematic Searching for Evidence in Medical Education including Medline, the Cumulative Index of Nursing and Allied Health Literature and the Educational Resources Information Centre.<sup>9</sup> Grey literature was searched from the System for Information on Grey Literature, ProQuest Dissertation & Theses, Scopus (Conference papers), Books via Collections of Prince of Songkla University Library and Hatyai University Library, HEA Resources Centre, GMC Publications and the Education Database of the Thai Ministry of Education. The inclusion and exclusion criteria were showed in [table 1](#). The two main search key phrases were SDGs and ESD in medical education. Only articles in Thai and English published between 2009 and 2019 were included. Abstracts and full articles were reviewed to exclude duplication and irrelevant papers. Each article was summarised into data extraction form and then coded and synthesised.

**Table 1** The inclusion and exclusion criteria for literature review

Inclusion criteria	Exclusion criteria
1. Focus on education for sustainable development and sustainable development goals in all levels of medical education.	1. Published before 2009.
2. Target population covers from medical students, trainees and specialist doctors.	2. Published in a language other than Thai and English.
3. Include all study designs: quantitative research, qualitative research and mixed-method research.	

### Needs assessment and additional key issues of SDGs and ESD in postgraduate family medicine education

In-depth interviews were conducted to assess the relevant needs of family medicine training. All participants were experienced educators. We used the snowballing technique to identify experienced educators, started from the most senior one. There were six questions in the interview guide as showed in [box 1](#). We interviewed experienced educators until reaching data saturation. Saturation has attained widespread acceptance as a methodological principle in qualitative research. Saturation means that no additional data are being found.<sup>10</sup> We coded from the interview fieldnotes. The analysis was done by hand. Then, the codes were reduced to themes (core topics).

### Delphi study

A Delphi method was used to achieve consensus on the core topics of a sustainable development learning module for family physicians. In the Delphi method, equal weights are given to the opinions of each individual. The surveys are blinded to ensure anonymity and several rounds or iterations are conducted so that the experts can consider the results of previous rounds and change their answers if they wish.<sup>11</sup>

We modified the Delphi method. We used both questionnaire survey and open-ended questions as the first round. All issues emanating from the open-ended questions and free-text comments were added to the questionnaire in the second round.

### Box 1 Interview guide for in-depth interview

1. What are Sustainable Development Goals (SDGs)?
2. Did your teaching relate to Sustainable Development Goals (SDGs)? If yes, how?
3. Are there any topics related to Sustainable Development Goals (SDGs) in the family medicine curriculum?
4. How did Sustainable Development Goals (SDGs) relate to family medicine?
5. Is there an online learning need about sustainable development for family medicine trainees?
6. Is there anything else you would like to add?

**Table 2** Literature review: core topics of Sustainable Development Goals (SDGs) and Education for Sustainable development (ESD) in medical education

No	Key issues
1	Definition of sustainable development
2	SDGs
3	New concepts of sustainable development
4	Core developmental issues
5	Global health competency domains
6	Thai context of sustainable development
7	Challenges facing the Thai education system
8	Definition of ESD
9	Characteristics of ESD
10	Sustainable development in medical education
11	Examples of ESD
12	Learning experiences and assessment

### Delphi expert panelists

There are 22 members of the Residency Training Committee of the Royal College of Family Physicians of Thailand. All of them were invited, except for Krishna Suvarnabhumi as the principal investigator of this study. The total number of Delphi expert panellists was 21 persons. They are experienced educators of family medicine and representatives from their residency training programmes. Names of the participants and institutions were coded to ensure confidentiality and anonymity.

### Delphi starting documents

Three documents were sent to the participants including (1) A summary of the literature review on SDGs and ESD in medical education, (2) Needs assessment and additional key issues of SDGs and ESD in postgraduate family medicine education from the in-depth interviews and (3) Education for SDGs Learning Objectives developed by United Nations Educational, Scientific and Cultural Organisation.<sup>4</sup>

### Delphi protocol first round

The questionnaire, using Google Forms, was developed based on analysis of the Delphi starting documents. The response format was a five-point Likert scale as (1) strongly disagree, (2) moderately disagree, (3) neither agree nor disagree, (4) moderately agree and (5) strongly agree. The questionnaire was tested to ensure that there were no technical errors, and it was user-friendly. The questionnaire was tested by three supervisors from Doctoral programmes of Faculty of Education and Liberal Arts, Hatyai University. Then, the questionnaire survey was open for 4 weeks. We sent an email to remind participants if there was no response and set up criteria for agreement as follows: (1) Median more than 3.5, (2) Median and Mode difference less than 1.0, (3) IQR less than 1.5 and (4) Coefficient of variation between 0 and 0.5.

**Table 3** In-depth interviews: additional core topics relevant to family medicine training

No	Additional core topics
1	Concepts and principles of sustainable development Example quote from the interview: 'The series of lecture may be need to give trainees Concepts and principles of sustainable development.' (Interview no 7)
2	Sustainable development and family practice Example quote from the interview: 'Sustainable development should not only teach in classroom. We must demonstrate them how it relates to family medicine and how to integrate into family practice.' (Interview no 5)

### Delphi protocol second round

The revised version was then sent to the participants. This second questionnaire survey included opinions from the open-ended questions and free-text comments from the first round. Participants were asked to rescore their agreement on the core topics of the sustainable development learning module for family physicians and re-rate each item on the same five-point Likert scale. They were encouraged to make free-text suggestions on the current items and any additional items that should be included. Similar to the first round, the second round of the questionnaire survey was open for 4 weeks. We sent an email to remind participants if there was no response and used the same criteria for agreement as in the first round.

## RESULTS

### Literature review

A total of 2035 articles were collected from the core databases, with 576 articles from grey literature. After reviewing the abstracts and full articles, 26 articles were included in the literature review. We coded from the article summaries. The analysis was done by hand. Then,

**Table 4** Participant characteristics (n=21)

Characteristics	
1. Gender	
Male	10 persons (47.6%)
Female	11 persons (52.4%)
2. Age	
Minimum	37 years
Maximum	74 years
Mean	51.5 years (SD 11.2)
3. Specialty	
Family medicine	21 persons (100%)
Other	–

**Table 5** Delphi survey: core topics of sustainable development for family physicians

Core topics and topics	First round (n=21)			Second round (n=19)		
	Mode	Median (IQR)	Coefficient of variation	Mode	Median (IQR)	Coefficient of variation
Core topic 1 Definition of sustainable development						
C1 Improve quality of life	5	5 (5–5)	0.11	5	5 (5–5)	0.07
C2 Balance of development	5	5 (4–5)	0.21	5	5 (4–5)	0.10
C3 Core topics of sustainable development	5	5 (4–5)	0.15	5	5 (4–5)	0.10
C4 Resilience of individuals, families, communities, institutions and nations.	5	5 (4–5)	0.13	5	5 (4–5)	0.09
C5 Inclusive development	5	5 (5–5)	0.13	5	5 (5–5)	0
Core topic 2 Principles of sustainable development						
C6 Globalisation	5	5 (4–5)	0.10	5	5 (5–5)	0.07
C7 Global development	5	5 (4–5)	0.13	5	5 (4–5)	0.09
C8 Social development	5	5 (4–5)	0.13	5	5 (5–5)	0.09
C9 Decrease inequality and promote human rights	5	5 (5–5)	0.11	5	5 (5–5)	0.05
C10 Means of implementation	5	5 (4–5)	0.12	5	5 (5–5)	0.09
Core topic 3 Sustainable Development Goals (SDGs)						
C11 No poverty	5	5 (5–5)	0.08	5	5 (5–5)	0.09
C12 Zero hunger	5	5 (5–5)	0.06	5	5 (5–5)	0.07
C13 Good health and well-being	5	5 (5–5)	0.06	5	5 (5–5)	0.07
C14 Quality education	5	5 (5–5)	0.07	5	5 (5–5)	0.07
C15 Gender equality	5	5 (5–5)	0.08	5	5 (5–5)	0.09
C16 Clean water and sanitation	5	5 (5–5)	0.10	5	5 (5–5)	0.05
C17 Affordable and clean energy	5	5 (5–5)	0.06	5	5 (5–5)	0.05
C18 Decent work and economic growth	5	5 (4.5–5)	0.09	5	5 (5–5)	0.08
C19 Industry, innovation and infrastructure	5	5 (4.5–5)	0.09	5	5 (5–5)	0.09
C20 Reduced inequalities	5	5 (5–5)	0.07	5	5 (5–5)	0.05
C21 Sustainable cities and communities	5	5 (5–5)	0.07	5	5 (5–5)	0.07
C22 Responsible consumption and production	5	5 (5–5)	0.08	5	5 (5–5)	0.07
C23 Climate action	5	5 (5–5)	0.08	5	5 (5–5)	0.05
C24 Life below water	5	5 (4–5)	0.17	5	5 (5–5)	0.09
C25 Life on land	5	5 (4–5)	0.13	5	5 (5–5)	0.08
C26 Peace, justice and strong institutions	5	5 (5–5)	0.08	5	5 (5–5)	0.07
C27 Partnerships for the goals	5	5 (5–5)	0.04	5	5 (5–5)	0.05
Core topic 4 New concept of sustainable development						
C28 Change from pillars to dimensions of development	5	5 (4.5–5)	0.09	5	5 (5–5)	0.07
C29 Focus on holistic development	5	5 (5–5)	0.08	5	5 (5–5)	0
C30 Promote long-term development	5	5 (5–5)	0.11	5	5 (5–5)	0
C31 Developmental Index	5	5 (4–5)	0.10	5	5 (5–5)	0.09
Core topic 5 Sustainable development in the Thai context						
C32 Balance of development	5	5 (4–5)	0.10	5	5 (5–5)	0.08
C33 Thai concept of sustainable development	5	5 (4–5)	0.17	5	5 (5–5)	0.12
C34 Sufficiency Economy Philosophy	5	5 (5–5)	0.11	5	5 (5–5)	0.07
C35 Thailand 4.0 policy and development strategies	5	5 (4–5)	0.23	5	5 (4–5)	0.15
C36 Education for Thailand 4.0	5	5 (5–5)	0.17	5	5 (5–5)	0.07
C37 Human development in 21st century	5	5 (4–5)	0.10	5	5 (4–5)	0.10
Core topic 6 Sustainable development and principles of family medicine						
C38 Healthcare need and health system	5	5 (5–5)	0.08	5	5 (5–5)	0.08
C39 Holistic care, comprehensive care and patient centred care	5	5 (5–5)	0.06	5	5 (5–5)	0.05
C40 People and community participation, collaboration	5	5 (5–5)	0.11	5	5 (5–5)	0.05
Core topic 7 Sustainable development and family practice						
C41 Integrated sustainable development with healthcare	5	5 (5–5)	0.07	5	5 (5–5)	0.07

Continued

**Table 5** Continued

Core topics and topics	First round (n=21)			Second round (n=19)		
	Mode	Median (IQR)	Coefficient of variation	Mode	Median (IQR)	Coefficient of variation
C42 From theory to practice	5	5 (5–5)	0.07	5	5 (5–5)	0
C43 Use community resources	5	5 (5–5)	0.08	5	5 (5–5)	0.11
C44 Local wisdoms and context	5	5 (5–5)	0.13	5	5 (5–5)	0.11
C45 Knowledge management on sustainable development	5	5 (5–5)	0.14	5	5 (5–5)	0.10

the codes were reduced to themes (core topics) of SDGs and ESD in medical education ([table 2](#)).

### Needs assessment and additional core topics of SDGs and ESD in postgraduate family medicine education

We used the snowballing technique to identify experienced educators and interviewed 11 educators using the interview guide until reaching data saturation. Ten educators stated that SDGs were closely related to family medicine, while eight suggested that we needed to provide postgraduate student online learning modules blended with learning from real experience in family practices. Most core topics of the SDGs and ESD were identical to the summary of literature review. Only two core topics were added ([table 3](#)).

### Delphi study

#### Delphi expert panel

All of the 21 experienced educators contacted agreed to participate in the study. All educators responded in the first Delphi round (response rate of 100%), while the second Delphi round had a response rate of 90.5%

because two educators were busy with the COVID-19 pandemic ([table 4](#)). The first round was conducted in March 2021 and the second in April 2021.

In the first Delphi round, all 45 topics of sustainable development for family physicians met the criteria ([table 5](#)). Following the additional comments and suggestions, seven core topics were not changed. Only 13 topics (C5, C6, C8, C10, C30, C31, C34, C35, C39, C42, C43, C44, C45) were revised for the second round of the questionnaire. The example of revision was demonstrated in [table 6](#). A consensus was agreed, with no addition or change at the end of the second round. The summary results of the Delphi study are shown in [table 7](#).

### DISCUSSION

Twelve core topics of sustainable development were identified for family physicians from the literature review and in-depth interviews. The first round of the Delphi survey was concluded by identifying seven core topics and additional contents. The second round developed consensus

**Table 6** Example of topic revision

First round questionnaire	Second round questionnaire
Core topic 5 Sustainable development in the Thai context	
1. The development balances economic, social, environment, and culture.	1. The development balances economic, social, environment, and culture.
2. In Thailand, concept of sustainable development has resonance to Sufficiency Economy Philosophy.	2. In Thailand, concept of sustainable development has resonance to Sufficiency Economy Philosophy.
3. Sufficiency Economy Philosophy is development strategy that focus on moderation, rationalisation and use of knowledge and moral principle in daily living.	3. Sufficiency Economy Philosophy is development strategy that focus on moderation, rationalisation, resilience, conscientious manner, and use of knowledge and moral principle in daily living.
4. Thailand 4.0 is the development policy that will lead us to sustainable development. The strategies include Sufficiency Economy Philosophy, value-based economy, innovation, technology, creativity, well-being and environment friendly.	4. Thailand 4.0 is the development policy that will lead us to sustainable development. The strategies include Sufficiency Economy Philosophy, value-based economy, innovation, technology, creativity, well-being and environment friendly. It will increase value and competency of our citizens in all age groups.
5. Education for Thailand 4.0, to make perfect citizen, we should focus on quality education, wisdom community, and learning environment.	5. Education for Thailand 4.0, to make perfect citizen, we should focus on quality education, wisdom community, and learning environment.
6. Human development in 21st century, we promote collaboration, public-private partnership, and ASEAN community.	6. Human development in 21st century, we promote collaboration, public-private partnership, and ASEAN community.
ASEAN, Association of Southeast Asian Nations.	

**Table 7** Summary of results

Delphi study	Results
Delphi starting document	Twelve core topics from the literature review Two core topics from the in-depth interviews
Delphi first round	Seven core topics with consensus and additional suggestions for change
Delphi second round	Seven core topics with consensus
Finalised items	Seven core topics grouped within three main objectives 1. Understand the concepts and principles of sustainable development 2. Identify the 17 Sustainable Development Goals of the United Nations 3. Integrate sustainable development into family practice

among the experienced educators of the seven core topics as (1) a definition of sustainable development, (2) principles of sustainable development, (3) SDGs, (4) a new concept of sustainable development, (5) sustainable development in the context of Thailand, (6) sustainable development and principles of family medicine and (7) sustainable development and family practice. All core topics were sourced from the literature review and in-depth interviews and then confirmed by the experienced educators in the Delphi surveys. Students were prepared to have global competency, but local context is still important. The fifth core topics showed that global and local contexts in education programmes must be balanced to allow students to adapt to the requirements of a rapidly changing future in local and global healthcare.<sup>12</sup>

The sixth core topics comprised expert opinions in the field of family medicine collected by in-depth interviews and the Delphi survey. Lastly, the seventh core topics presented suggestions as to how this should be done. Sustainable development must be integrated with patient care. Students should have knowledge and skills and be able to work with other health professions.<sup>13</sup> Integration with patient care also demonstrated that health and sustainable development are inseparable in an increasingly globalised and interconnected world.<sup>14 15</sup> These seven core topics were grouped within three main objectives and three submodules including (1) Concept and principles of sustainable development, (2) SDGs and (3) Sustainable development and its integration with family practice. Objectives, learning experiences and evaluation of sustainable development online learning module for family physicians were demonstrated in [table 8](#).

Student assessments can be integrated with the online module to ensure module consistency and identify precise connections between learning objectives, learning experiences and evaluations.<sup>16</sup> Module evaluation can be conducted using the CIPP Model and include Context Evaluation, Input Evaluation, Process Evaluation and Product Evaluation.

The limitation of this study was that it includes only the development phase of the online module. Moreover, there was no similar previously published literature to be compare. We would like to demonstrate how we generated online learning module contents. It may be useful for whom would like to develop online course.

## CONCLUSIONS

An online learning module of Sustainable Development for family physicians was developed using a modified

**Table 8** Objectives, learning experiences and evaluation of sustainable development online learning module for family physicians

Objectives	Learning experiences	Evaluation
1. Understand concept and principle of sustainable development	Submodule 1: Concept and principles of sustainable development 1.1 Definition of Sustainable Development and the core topics 1.2 Globalisation, Poverty and Inequality 1.3 Social development 1.4 Means of Implementation for sustainable development	▶ Online quizzes ▶ Online essay questions ▶ Online module evaluation survey
2. Categorise Sustainable Development Goals	Submodule 2: Sustainable Development Goals 2.1 Well-being—Sustainable Development Goals 2.2 Infrastructures—Sustainable Development Goals 2.3 Natural Environment and One Health—Sustainable Development Goals 2.4 New Concepts of Sustainable Development	▶ Online quizzes ▶ Online essay questions ▶ Online module evaluation survey
3. Sustainable development and its integration with family practice.	Submodule 3: Sustainable development and its integration with family practice. 3.1 Sustainable Development in Thai Contexts 3.2 Sustainable Development and Principles of Family Medicine 3.3 Integration of Sustainable Development in Medical Practice 3.4 Learning of Sustainable Development Through Community Practice	▶ Online quizzes ▶ Online essay questions ▶ Online module evaluation survey

Delphi method that included three submodules as (1) Concept and principles of sustainable development, (2) SDGs and (3) Sustainable development and its integration with family practice. This module will provide additional resources for family medicine students and Thai family physicians to expand their knowledge and perspectives of sustainable development.

**Contributors** KS, SJ, WD and JA initiated the study concepts. All authors contributed to data collection and analysis. KS wrote the first draft of the manuscript that was then read and revised by the rest of the team. All authors read and approved the final version of the manuscript. KS is the guarantor. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

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**Patient consent for publication** Not applicable.

**Ethics approval** This study was approved by the Research Ethics Committee of Hatyai University (REC.2563.6119060010). Participants gave informed consent to participate in the study before taking part.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** Data are available on reasonable request. Extra data can be accessed via the Dryad data repository at <http://datadryad.org/> with the doi: 10.5061/dryad.kpr4xh81.

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#### ORCID iD

Krishna Suvarnabhumi <http://orcid.org/0000-0002-6724-8073>

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