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Re-envisioning a "skills framework" to meet 21st century demands: What do young people need?

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Young people today face rapidly changing landscapes in all aspects of life. These changes pose challenges to the wellbeing of future generations and the success of the global commitment to Sustainable Development Goals (SDGs). The skills framework project was introduced to reexamine the "Life skills"/Skills Education Framework to guide the direction of twenty-first century skills in Thai Education. Skills frameworks have been developed and proposed by various organizations. In re-envisioning one for Thailand's young people, it was crucial to involve them in the process. This paper describes a design-thinking approach to developing a skills framework involving stakeholders' voices and, crucially, Thai children and youth. The paper argues that any skills framework for the twenty-first century must include young people's values and aspirations. This study shows that while Thai children and adolescents share common interests and have the vision to make Thailand a prosperous nation, they differ in their focus on required skills and are also challenging some core values. The proposed basic education skills framework is designed to be comprehensive and flexible. It encompasses a global skills framework to meet twenty-first century needs and support global commitments to the SDGs. At the same, it reflects the diverse needs of Thailand's stakeholders, especially young people. It also emphasizes the principles of applicability, adaptability and relevance and seeks to reflect the aspirations and dreams of its young people in the context of a changing environment and future demands.

KEYWORDS

21st century skills, skills framework, Thai basic education, participatory approach, children and youth participation, SDG4 quality education, competency-based curriculum

Introduction

Worldwide attention given to life skills education and skills development has been driven by the explicit inclusion of skills in the Education Sustainable Development Goal No. 4 of the United Nations. Goal No. 4 highlights the importance of obtaining a quality education as the foundation for creating sustainable development. Quality education in this regard means going beyond knowledge acquisition and literacy and numeracy skills. Instead, greater focus is placed on other enabling skills. Several global frameworks have been put forward in recent years outlining the most crucial skills for young people in the twenty-first century and the future world of work. However, some argue that these processes and frameworks rarely involve young people themselves and fail to empower them to define their own goals and aspirations, including obtaining the skills that they identify as important.

The 2030 Agenda is explicitly based on the Universal Declaration of Human Rights and International Human rights treatise. In existing implementation, monitoring and accountability plans for the SDGs (especially SDG 4) children's voices are a particularly glaring omission (Fox and Stoett, 2016; McGrath and Nolan, 2017). To rectify this, the Office of the Basic Education Commission (within the Ministry of Education) launched a project called Skills Framework Development for Basic Education. In consultation with young people and in partnership with UNICEF and the Faculty of Education, Kasetsart University, its aim is to equip young Thai learners with skills that are more relevant to twenty-first century demands. Such skills need to be transformative and build resilience so that young people can become active citizens who will contribute to the sustainable development of the country and the global community. Recognizing the importance of public participation in helping policymakers arrive at more legitimate decisions (Gastil, 2017; Jami and Walsh, 2017), a participatory approach was adopted, beginning with generating ideas from young people themselves. A rights-based and democratic citizenship approach empowers the participation of young people in education policy processes that concern them (United Nations International Children's Emergency Fund [UNICEF], 1992; Fleming, 2015; Fox and Stoett, 2016). In addition, a steering committee was established to provide strategic direction and facilitate the participation of various sectors. The committee consisted of high-level policymakers with different functions under the Ministry of Education, representatives from agencies related to education provision, UNESCO, UNICEF, Right to Play,[1] private/business sectors and the research team from Kasetsart University.

This paper discusses the development of the new skills framework. The multi-stage research design began with a thorough review of the global and local literature and policies regarding skills frameworks. Activities were then set in motion to involve young people. The paper describes the process of categorizing the skills that young people and adult stakeholders identified as important and necessary and the values they prioritized. The paper then presents the framework that was the result of the consultation process and concludes with policy guidelines and recommendations.

Literature review

Global frameworks, local skills, young futures

Since the turn of the twenty-first century, various organizations have introduced global skills framework to help in thinking about life skills priorities. These include UNESCO's four pillars of learning (i.e., learning to know, learning to do, learning to be, and learning to live together); UNESCO's global citizenship (i.e., cognitive skills, social skills, morals, ethics, attitudes, and values); the OECD's global competency (i.e., skills, knowledge and understanding, attitudes, and values); and the ATC21S framework (i.e., knowledge, attitudes, values, and ethics). UNICEF's Young People's Agenda emphasizes the importance of skills development to address education, skills and employment challenges faced by adolescents and youth. The agenda is underpinned by the idea that "Young people are the future. Their ideas, energy and enthusiasm can change the world" (United Nations International Children's Emergency Fund [UNICEF], 2018, para. 4). The UNICEF Global Framework on Transferable Skills identifies 12 key skills to be developed, encompassing four areas: active citizenship, learning, employability and entrepreneurship, and personal empowerment (United Nations International Children's Emergency Fund [UNICEF], 2019).

There has also been a focus on what is referred to as life skills. In European contexts, life skills required for increasing employment prospects of vocational education and training professionals are numeracy, literacy, communication, ICT, interpersonal skills, foreign language skills, entrepreneurial skills, job-seeking skills, and learning to learn. These skills are seen as fundamental to lifelong learning (Simona, 2015). However, in the context of basic education, scholars argue that skills should be extended beyond life skills. For Generation Z and Alpha young people, transversal skills are useful to diagnose the environment and task in a specific context, relate to and communicate with the people involved and address the issues both at a mental and emotional level. This can then lead to devising the best solutions, setting goals, developing strategies and building and implementing action plans (Cinque, 2016). A review by Lamb et al. (2017) lists "essential" skills for the twenty-first Century as critical thinking, creativity, metacognition, problem-solving,

1 Right to Play is an international organization expert in life skills and working closely with the Ministry of Education Thailand.

collaboration, motivation, self-efficacy, conscientiousness, and grit or perseverance. Integrating these skills into the curriculum has been on the agenda of organizations such as the OECD, UNESCO, and P21 for some time and theoretical frameworks have been developed to define these skills. There is an acknowledgment of the interdisciplinary nature of such skills and the need for new teaching and assessment methods to incorporate them. However, it is not yet clear how the curriculum should be structured (González-Salamanca et al., 2020).

Skills education in Thailand: Implementation, success, challenges

Since the early 2000s, Thailand has attempted to move away from a content-based toward a competency-based curriculum, with a strong focus on transversal/twenty-first century skills. In a major curriculum reform in 2008, the five core competencies were identified as communication, thinking, problem-solving, life skills and technology. These competencies align with the twenty-first century skills promoted in the global context. In the same year, the Office for Basic Education Commission (OBEC) developed the skills framework which forms the starting point for the development of the framework described in this paper. The framework comprises knowledge, attitudes and skills (i.e., appreciation of one's and others' values; analyzing, making a decision, and solving problems creatively; emotion and stress management; and building good relationships with others). However, a joint OECD-UNESCO Education Policy Review found that Thailand's curriculum needed more clarity, consistency and relevance and that it should "place increased and more consistent emphasis on the development of key competencies for the twenty-first century" (Organisation for Economic Co-operation and Development [OECD], 2016, p. 22). The OBEC Life Skills Framework implemented since 2008 also required an update to ensure its current and continued relevance.

In 2019, in collaboration with the Office of Education Council (Office of Education Commission [OEC], 2019), the Independent Committee for Education Reform on competency-based curriculum introduced a report on Education Reform. According to the report, a competency-based curriculum for Basic Education in Thailand, should consist of four essential components: Literate Thais, Happy Thais, Smart Thais and Active Thai Citizens. These four components encompass 10 core competencies as follows (Office of Education Commission [OEC], 2019):

i. Scientific Inquiry and Scientific Mind
ii. English for Communication
iii. Life Skills and Personal Growth
iv. Career Skills and Entrepreneurship
v. Higher-Order Thinking Skills and Innovation
vi. Media, Information, and Digital Literacy
vii. Collaboration, Teamwork, and Leadership
viii. Active Citizen with Global Mindedness
ix. Thai Language for Communication
x. Mathematics in Everyday Life

These are in line with the five core competencies of the standard-based curriculum B.E. 2551 which emphasized local education and wisdom but suggested more areas for consideration. These included collaboration, teamwork, leadership, active citizenship, and global-mindedness. In addition, in the competency-based curriculum, the four essential components out of the 10 competencies were very much linked to subject-based learning.

To assist schools and teachers in implementing life skills/skills education in the classroom, various resources have been developed. The Institute of National Testing has developed guidelines for designing teaching and learning activities. In 2013, two resources were produced: *Guidelines for Life Skills Development: Integrated Teaching and Learning into 8 Subject Areas of National Core Curriculum B.E.2551,* developed by OBEC in collaboration with Right to Play[2] (Office of Basic Education Commission [OBEC], 2013); and *"Life Skills: Teacher's Code in the twenty-first century"* developed by OBEC in collaboration with UNICEF and Right to Play (Office of Basic Education Commission [OBEC], 2017). In addition, in 2016, *Guidelines for Designing Guidance Activities for Skills Development of Youth* was produced (by Office of Basic Education Commission [OBEC], 2016 in collaboration with Thai Guidance Association) which includes a section on life skills development. The Bureau of Student Activities Development also developed a series of handbooks for life skills development to be implemented in scout education[3] In addition, OBEC published a series of handbooks to support the new Life Skills Framework, including one which defines and provides indicators for each competency, along with guidelines, framework, approach, three sets of assessment tools, criteria for assessment, and how to interpret the results.

There is evidence that schools report on the development and assessment of the five core competencies to the Education Service Area of their jurisdiction. However, the extent to which life skills or these five competencies have been successfully implemented is unknown since there has been no national report on the outcomes of these five competencies. For example, the handbooks referred to above are only guidelines. Implementation is left to each school: schools can choose to

2 Right to Play Thailand worked with OBEC and UNICEF in developing the Life Skills Framework and related documents used as guidelines for implementation in 2008.

3 Scout education is an extra-curricular subject included in the National Core Curriculum.

design their own teaching and learning approaches and develop their own assessment in line with the school curriculum.

A review of 60 teachers' self-reports on how skills education and the five competencies are implemented in school revealed that the five core competencies are reflected in the school curriculum.[4] However, schools differ in terms of how the five core competencies are carried out in practice. While some schools are found to integrate these competencies into subject-based teaching, cascaded through school curriculum standards and learning indicators, most are found to integrate these competencies into project-based learning and extra-curricular activities. Some schools have assigned leading subjects for each competency. For example, the Thai language and English language develop communication capacity, and science and mathematics develop problem-solving capacity. Teachers are found to be key people in selecting the indicators of each competency to be included in their lesson plan.

An evaluation of the Basic Education Core Curriculum 2008 (Nillapun et al., 2018) revealed that there was too much detail in the mission and principles and that actual competencies were very difficult to evaluate. Moreover, the vision and desirable features did not reflect or make reference to the needs of schools, communities, and locals. The authors concluded that the standard and indicators of the Basic Education Core Curriculum 2008 are not fit for purpose in terms of measuring quality of learning. The administrators and teachers lack knowledge and understanding of a range of aspects: curriculum management administration; the design process for standard teaching techniques; how to measure and evaluate based on authentic assessment; and assessment of young people's social engagement activities such as volunteering.

Despite its limitations, one major success of the OBEC Life Skills Education Framework is that it has been widely adopted as a conceptual framework of research on life skills education in Thailand by many scholars (e.g., Funfuengfu et al., 2014; Khamthanee et al., 2014; Kongvimon et al., 2015; Kantree, 2016). It has also guided life skills education delivery in schools in various forms: integration of life skills education into subjects; life skills education as student development activities in schools; and life skills education as part of the "Moderate Class More Knowledge Project" assigned to schools by the OBEC. In other words, it has provided a major life skills framework for discussion, research and practice in Thailand. However, Thai educators argue that life skills/skills education should be able to accommodate the needs of various groups of youth in Thailand and that they should be able to thrive in global contexts while maintaining "Thai" ness and local wisdom (see e.g., Khamthanee et al., 2014; Praraksa et al., 2019).

4 The review of 60 teachers' self-reports was derived from a class assignment given to student teachers from diverse school contexts enrolled in the class Education Standard and Quality in the academic year 2019 at Kasetsart University.

Research method

This advocacy research employed a participatory approach and multi-stage research design to influence education policy underpinning the development of a new skills framework. Its starting point was to listen to the voices of young people through participatory workshops and online polls to ascertain what skills they viewed as important for their futures. The research design consisted of three phases: (1) generating essential skills, (2) identifying skills needs through a national survey, and (3) developing a new skills framework through a consultation process.

Phase I: Generating essential skills

Two main activities were set up to generate ideas from stakeholders regarding the skills viewed as essential for life. The first activity involved brainstorming workshops organized with stakeholders and youth in six provinces. In the second activity, children and youth were invited to respond to three polls through the "Dare to Dream Campaign."[5]

Activity 1: Brainstorming workshops with stakeholders and youth

The stakeholder workshops organized in six provinces were attended by 10 education providers, 10 teachers, 10 parents, 10 civil society representatives, and 10 workers, a total of 300 participants across the six provinces; participants were drawn from neighboring provinces as well (see **Table 1**). The sampling for each region was administered by the representative of the Education Service Area or Provincial Education Authority of each region. One student workshop was organized in Patumthani Province with sampling as follows: 132 youth from grades 6–12 across genders, school affiliations, from a range of academic achievement and socio-economic-cultural backgrounds and 1st and 2nd-year college students.

It is important to design activities that will allow participants to reflect upon "what is. . ." and "what should be. . ." through a creative process. The KU team, OBEC team, UNICEF, and Right to Play agreed that using a photo gallery would stimulate participants' thinking process in envisioning the skills that might be needed in the future. Allowing them to relate their own experiences to the photos of everyday life situations would also help them to anticipate what challenges they might face in the future. Photos selected for idea generation were drawn from various aspects of life (learning, living, working, and interacting) in the context of health, family, environment, technology, occupational, and civic activities. In the workshop, stakeholders

5 Dare to Dream is a campaign organized by UNICEF to empower Thai youth across the country to express themselves and their opinions on education, skill sets, and what is required to prepare them for the future.

TABLE 1 Sampling procedure for workshops.

Region	Province	Justification
North	Chiangrai	– Diverse culture and Ethnic groups – Rich in natural resources – Border to Laos PDR and Myanmar
Northeast	Ubon Ratchthani	– The 2nd biggest province in the Northeast – Fast-growing economy to become the center of the workforce in the Northeast – Diverse culture with border to Lao PDR
East	Rayong	– Industrial hub as part of Eastern Economic Corridor – Fast growing economy in industry, tourism, agriculture – Highest income per GDP
West	Kanchanaburi	– The 3rd largest province in the country – Rich in natural resources and eco-tourism – Diverse and long history of culture with border to Myanmar
Central	Pathum Thani	– Fast growing economy – Semi urban and rural with agricultural and industrial sectors
South	Songkhla	– The 2nd largest number of populations in the South – Diverse culture and ethnic groups of people e.g., Chinese, Malay, Thai

were assigned to a group based on whether they were primarily representing teachers, parents, civil society, the workforce, and education providers. During the workshop activity, each participant was asked to write down skills that they thought were essential after each photo was shown on a post-it pad. They were asked to share ideas with their group, categorize the skills identified and then present their group results. Every participant was asked to walk around the room to see the results of other groups. They were then asked to reflect on the most essential skills via a word cloud application "Answer Garden" which showed the most rated items of skills in word size with frequency. For data analysis, the skills on the post-it pads were collected and analyzed using content and thematic analysis to categorize the skills.

Activity 2: Children and youth's voices through the "dare to dream campaign"

After the brainstorming workshops, three online polls were conducted with 20,109 children and youth across the nation to generate broader ideas on skills viewed as essential to them. The three online polls were entitled: Dream of the Future; Skills of the Future; Expected Outcomes from School. Facebook Messenger was used as part of the "Dare to Dream" campaign organized by UNICEF's Youth Section using "U-Report",[6] which has a youth network nationwide, including youth from marginalized groups. UNICEF's youth section and the research team developed the questions for the online polls and shared them with youth leaders from the network for their insights to ensure item and language suitability prior to the polls being launched. To obtain more insights on skills of the future and recommendations for skills education, a workshop entitled Dare to Imagine was held at a theater in downtown Bangkok in the form of "brain hack"[7] activities. 30 children and young people attended this event.

Phase II: National survey of skills needs

The purpose of the survey was to engage more broadly with stakeholders in diverse contexts to identify other skills gaps. One-hundred and seventy skill items derived from the review of the literature and policy documents, stakeholder and student workshops and the three polls were classified based on existing Life Skill Framework components. Additional skills that did not fit within the four components of the Life Skill Framework were also included. The survey instrument used four scales of dual response questionnaire, with reliability of 0.993: respondents rated each skill item according to the level of skill that the student had already and the level the student was expected to have.

Multi-stage sampling was used to ensure good representation: 1,808 schools (1,464 primary schools, 336 secondary schools, and eight special education schools) took part. Proportionate sampling according to school size was applied. For each chosen school, a self-completing questionnaire was sent to one school director, eight subject teachers, one extra-curricular teacher, two educational supervisors, five parents, five youth in 6th grade, five youth in 9th grade, and five youth in 12th grade via an online survey platform, with a consensual process developed by the project team. The total number of samples was 34,844 and total responses, 28,437, accounting for 81.6%. Table 2 shows the sampling procedure.

6 U-Report is an initiative in more than 20 countries worldwide and has more than two million members of U-Report. In Thailand, children, adolescents, and youth can also join U-Report/U-Reporter to share their opinions through polls to be one of the driving forces for social change and to influence the country's policymakers in planning and formulating strategies to meet the needs of children, adolescents, and youth.

7 Brain hack is the use of methods and/or technologies to affect a person's state of mind, cognitive process, or level of function.

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TABLE 2 Sampling procedure for survey.

Educational provision	No. of service area	No. of total schools	School size				Target respondents					Youth		
			Small	Medium	Large	Extra large	Director	8 subject teachers	1 extracurricular teacher	2 ed. supervisor	5 parents	5 grade 6th	5 grade 9th	5 grade 12th
Primary	183	1,464	366	366	366	366	1,464	7,686	1,464	366	7,320	7,320	500	
Secondary	42	336	84	84	84	84	336	2,688	336	84	1,680		1,680	1,680
Special education	8 areas/99 schools	8					8	64	8		40	40	40	40
Total		1,808	450	450	450	450	1,808	10,438	1,808	450	9,040	7,360	2,220	1,720
									23,544	Total	34,844		11,300	
Total no. of respondents														

A Priority Need Index of 170 skills derived from the survey questionnaire was then analyzed using PNImodified = (I-D)/D where "I" means the mean score of importance or expectation and "D" means the mean score of degree of success. The PNI modified highlighted which skills were considered essential. These were then used to further classify skill clusters and skill factor component analysis. EFA or Exploratory factor analysis was employed to classify skills into components using the Varimax technique to identify the correlation of skills that should be put together into the same component.

Phase III: Developing a new skills framework

While young people's values, views, and aspirations need to be central to any new skills framework, account also has to be taken of those who contribute to drafting and implementing policies and those who have pivotal roles in the world of work and in civil society. The next stage toward re-envisioning the life skills framework was therefore to draft a new framework through a consultation process with key stakeholders, partners and experts for their comments and recommendations.

The existing life skills framework was used for the initial classification of skills. However, this framework is specific to life skills and does not embrace future skills, global skills, or national skillsets. Drafted by the core working group comprising the research team, UNICEF, OBEC, and Right to Play, it incorporated global skills frameworks and social and emotional learning skills. The aim was also to simplify and develop a holistic framework that is: relevant to Thai youth' needs; measurable with a clear distinction of values, skills, and characters; includes both foundational and transferable skills.

To classify skills into components relevant to contemporary learning theories and well-grounded in theories widely recognized, social, emotional learning, and learning domains were used as a frame of further analysis. This process employed reflective and critical dialogue: researchers in consultation with OBEC, UNICEF, and Right to Play classified each skill in Social Emotional Learning (SEL) and learning domains to ensure that each skill was relevant to learning theories for further development. The research team created name tags for the skill components and skill clusters that applied to the skill items classified under each component and cluster. When applying the name tag, the team also took into account the principles, aims and outcomes of education as prescribed by the National Education Act, 20 Year National Strategic Plan, National Education Plan, National Education Standard, and the competency-based curriculum.

Three consultative processes were undertaken as follows:

1. Focus groups with key stakeholders and partners

Key stakeholders were invited, using purposive sampling, to comment on the background, rationale and conceptualization of the 1st draft framework. Policymakers, policy implementers and academics were also invited to reflect upon what emerged from the grassroots level to shape a skills framework that aligned with the national and global agendas. Participants were selected in consultation with OBEC and UNICEF based on their role relevance, expertise and experiences working in the field of education or child development, and partnership with the Office of Basic Education Commission and UNICEF. 11 groups participated in the consultation:

(1) Representatives from various units of Ministry of Education (three groups)
(2) Other related government agencies working in relation with youth in Basic Education Level (one group)
(3) Association and professional organizations related to education of youth in Basic Education (one group)
(4) International organizations and embassies (two groups)
(5) Policy implementers (one group)
(6) Workforce sectors (one group)
(7) Civil society e.g., NGOs (one group)
(8) Academics (one group)

2. Focus Group with high-level influencers

To refine the framework and to ensure engagement of high-level influencers, the second draft was shared with a purposive sample of key social, policy, and academic influencers, in consultation with OBEC and UNICEF. Most of these influencers sit on various high-level committees of national organizations.

3. Steering Committee Approval and Recommendations

The final step was to gain approval from the Steering Committee on the final draft and to obtain their recommendations for further actions.

Results

Phase 1: Generating essential skills

Brainstorming workshops with stakeholders and students

Comparing what emerged from the workshops with stakeholders in the six regions and one workshop with students, similar skills were identified but with differences in emphasis. The greatest consensus with regards to the first five skills concerned the ability to use technology. While most stakeholders chose the ability to use technology as the most important, students chose environmental management skills, ranking the ability to use technology second in importance. The top five areas identified by the adult stakeholders also differed from the Students' list: while ability to use technology, problem-solving, first-aid, teamwork, and emotional and stress management were identified as essential by adults, the students were more concerned about environmental management, ability to use technology, communication, survival, and time management (see Table 3).

TABLE 3 Comparing stakeholder's and student's perspectives from workshops.

Stakeholders (N = 316)		Students (N = 132)	
Ability to use technology	185	Environmental management	97
Problem-solving	106	Ability to use technology	67
First-aid	93	Communication	44
Teamwork	93	Survival	43
Emotional and stress management	92	Time management	37

Children and youth voices through the "dare to dream campaign"

Most respondents were 15–19 years old, and were female, mostly from Bangkok, Nakorn Sri Thammarat, Nakhon Ratchasima, and Uttaradit. In the first poll "Dream of the Future," the ability to create good quality of life for themselves (22%) was selected as the most important. This was followed by thinking and problem-solving skills (19%) and multi-disciplinary knowledge (18%). Ability to create a good quality of life was ranked first by both male and female respondents. However, when comparing between regions, the desire to develop the ability to create a good quality of life was ranked first only by youth in the Eastern, Western, Central, and Northeastern regions. Youth from the North mostly wished to improve their multidisciplinary knowledge while youth in the South mostly wanted to enhance their thinking and problem-solving skills.

When asking youth about obstacles to their success, financial capital was considered the most significant by the largest proportion of respondents (37%). Several also believed that the biggest obstacle is their lack of unique skills and personality, which represented their human capital (34%). Male and female youth had different opinions in this regard. While male respondents perceived financial capital as the major obstacle, female respondents identified their own human capital as the major constraint. When comparing regions, youth in the South, the East, the West, and Centre perceived lack of human capital as the biggest obstacle while youth from the North and the Northeast mostly worried about their financial capital.

As for the future of Thailand, 30% of respondents wished to see Thai citizens have a good job with secure income but almost the same percentage (29%) wished to see peace and

harmony in the country. Female respondents and those from the North, the South and the East were mostly concerned with job security and income while their male counterparts and youth from the Centre and Northeast mostly focused on peace and harmony. As for youth from the West, financial security and peace in the country were regarded as equally important. Concerning the new S-Curve,[8] expected to drive Thailand in the next 20 years, 41% wish to see Thailand become a hub of comprehensive healthcare. The consensus included both male and female respondents across the regions.

Results from the second poll, "Skills of the Future," revealed that the most valued skills are seen as: communication and media literacy (24%); analytical thinking, decision-making, and problem-solving (21%); self-esteem and valuing others (15%); emotion and stress management (14%). Skills urgently needing development are analytical thinking, decision-making and problem-solving (36%), emotion and stress management (26%). To help them develop these skills, respondents thought that more emphasis is needed on learning by doing (33%) and on out-of-classroom learning (29%) rather than on written examinations. Most respondents (especially the girls) reported a lack of confidence regarding their ability to achieve the future they want.

Both male and female respondents view communication and media literacy as the most essential skills for the future, followed by the ability to think, analyze, make decisions, and solve problems. Both also agree that schools equipped them with essential skills to some extent. They also saw enhancing their thinking and problem-solving skills as urgent and most wished to see changes in schools in terms of emphasis on learning by doing and personalized learning, respectively.

In terms of regional differences, aside from respondents in the Western Region, all respondents expressed a lack of confidence in their ability to achieve their dream future. Respondents from the North, the West, the Centre and the Northeast reported a high level of trust in the value of communication skills and media literacy for their future. In contrast, respondents in the South and the East prioritized analytical thinking skills, decision-making skills, and problem-solving skills. Youth from all regions perceived that they had been moderately equipped by schools with the necessary skills. However, all regions except the North anticipated changes in schools in terms of increasing learning by doing. Respondents from the North expected changes in terms of an increase in learning outside the classroom.

The third poll, "Expected Outcomes from School" showed that adaption and problem-solving skills were viewed as most important (34%), followed by knowing and being oneself (25%) and lastly, obtaining decent jobs with a good income (17%). Respondents stated that their dream school would emphasize learning by doing (34%), allowing youth to learn only what they are interested in (24%) and offering youth direct experience outside the classroom (21%). Thirty-eight percent of respondents thought schools should prioritize flexible learning pathways while 18% selected a focus on developing the ability to think and solve problems relevant to youth. Sixteen percent of respondents thought schools should equip them with the ability to create a good quality of life for themselves. With regards to achieving social wellbeing, 38% of respondents believed that Thailand would become more competitive if schools prepared the workforce for a creative economy, while 16% of respondents believe that the competitiveness of Thailand depends on developing the workforce in medical science and 15% believe that it is the digital sector that is key to Thailand's competitiveness in the global arena. Interestingly, these percentages were the same across the genders and regions.

After the three polls, 30 young people were invited to the "Dare to Imagine" workshop to reflect on the skills that they think are needed. Critical thinking, daring to be oneself, adaptive life skills, financial management and learning skills were all considered valuable. With regards to the teaching and learning process, learning outside the classroom and learning by doing were highly valued as well as wanting less written examinations. In addition, the importance of understanding the needs of youth, listening to them and using questions in the classroom were identified as important. In other words, these young people envisioned a more student-centered approach, less bound by the traditional features of schooling.

Phase II: National survey of skills needs

The questionnaire survey revealed that among 170 skills, the top five skill items with the highest Priority Needs Index (PNI) are researching skills (PNI modified = 0.84), online business skills (PNI modified = 0.83), creating innovation skills (PNI modified = 0.81), using E-money (PNI modified = 0.79), and living with AI (PNI modified = 0.77). The five least important items were gratitude (PNI modified = 0.29), working honestly (PNI modified = 0.31), being honest (PNI modified = 0.32), being optimistic (PNI modified = 0.33), and having compassion (PNI modified = 0.33). Among the 170 skill items, gratitude is the only item with a PNI score slightly below 0.3, which means that all of these skills are considered essential in Basic Education and should be developed among all Thai youth. **Table 4** shows that while there were few differences in terms of the skills considered as necessary, there were slight differences in priority according to the different groups.

Comparing the 170 skill items identified through the diverse stakeholder activities to those in the 2008 (Office of Basic Education Commission [OBEC], 2008). Life Skills Framework,

8 The national economic plan covers 10 industries. Among these are 5 future industries: industrial robots, aviation and logistics, biofuel and biochemical industries, digital industry, and comprehensive medicine industry.

TABLE 4 Comparing skill needs priorities by groups.

Rank	Teachers	Youth	Parents	Education supervisor	School administrators
1	Researching	Doing online business	Doing online business	Researching	Using E-money
2	Doing online business	Foreign language	Using E-money	Strategic thinking and planning	Doing online business
3	Using E-money	– Creating innovation – Using E-money	Creating innovation	– Creating innovation – Foreign language	Researching
4	Creating innovation	– Researching – Entrepreneurship	– Living with AI – Researching	Rethinking	– Creating innovation – Living with AI
5	Living with AI	Creating online social network	Entrepreneurship	Critical thinking	Creating online social network

82 were categorized as "other" (for example, gratitude, being considerate, being innovative, doing online business, and living with AI). Most of them can be categorized either as cultural qualities (e.g., gratitude) or future-oriented (e.g., living with AI). This shows the gap that has developed between the 2008 Life Skill Framework and the perceived skills needs of Thai youth.

The four components of OBEC life skills were found to be necessary but insufficient for the twenty-first century, although some of these need to be classified as values and attitudes rather than skills. Classified into seven categories and presented using a Venn diagram, the seven categories comprise (1) foundational skills (which include 3Rs, language, thinking, digital and financial literacies), (2) self-awareness and management, (3) social awareness and active citizenship, (4) employability and entrepreneurship, (5) emotional and relationship management, and (6) teamwork and conflict management and (7) perseverance.

Phase III: Developing a new skills framework through a consultation process

In consultation with key stakeholders and partners in education, 29 additional skills were identified, including living the Thai way of life, using global knowledge for local use, information management, prediction skills, and energy conservation. However, stakeholders and partners also recommended reducing the number of skills by identifying only essential skills and simplifying them to ensure translation and feasibility in terms of implementation. Thus, the second draft of the framework included only essential skills and used statistical analysis to classify the skills and ensure clear distinctions between them. Skill items with PNI modified above 0.4 were included for the Exploratory Factor Analysis (EFA) using the Varimax technique to identify the correlation of skills that should be in the same category. All the essential skills that come from stakeholders are linked together under the theme "Students' Essential Skills for the Future." We classified skills using exploratory factor analysis (EFA), a family of multivariate statistical methods, to make it easy for practitioners to use them. The EFA looks for the fewest speculative constructions that can account for the covariation seen among a group of measured variables; that is, to determine the shared elements that account for the arrangement and structure of the measured variables. In this case, skills with a factor loading higher than 0.4 were included, meaning that they are correlated to form the skills framework. However, at one level of factor analysis, the link between factors is clarified using the statistical approach known as Varimax rotation. The procedure often entails changing the coordinates of data obtained from the analysis of the main components. The process of adjustment is meant to increase the variance shared among the elements. Results more discretely depict how data correlate with each principal component by maximizing the shared variance. To raise the squared correlation of items related to one component while decreasing the correlation on any other factor is to maximize the variance, according to most definitions. In other words, by eliminating the intermediate ground and more precisely determining the element upon which data loads, the Varimax rotation simplifies the loading of items. In this study, the EFA, with the use of Varimax rotation, generated five skill components with a 60% variance. Only high factor weighting was considered, meaning that at least 60% of skills would be developed through this skills framework for Basic Education.

The second draft was then reviewed by the scholars and social influencers with the rationale, aims, and principles of the framework. It was agreed that they were appropriate in terms of being future-oriented, reflecting soft skills, hard skills, and meta-skills. The experts further concluded that the focus was on the skills needed in the life of a child and that social, environmental and sustainability concerns were addressed. However, they felt that literacy, equity, morals and values also needed to be highlighted. In addition, they pointed out that skills needed for the future are rapidly changing; given that the future is unpredictable, building character, e.g., discipline, perseverance, hard work, embracing differences, and complex problem-solving is perhaps more important than or equally important to such skills.

Proposed skills framework for children in basic education

Figure 1 shows the skills framework for basic education, comprising 5 skill components and 14 skill clusters. Details of the skills framework are presented below.

Principles of the skills framework

The overall aim of the framework is to ensure that youth have the essential skills for living a happy life in the present and future in their academic and work life, within the family, wider society, and globally. The skills framework is designed to be used as a guideline. Since Thailand is a diverse society, it needs to be flexible and contextualized, with the ability to respond to the diverse needs of youth and various stakeholder groups. The framework seeks to conceptualize the essential skills that are relevant to youth in diverse and changing contexts and that can meet the needs of both national and global development. The four underlying principles are:

1. Skills must be contextualized, personalized, and relevant to Student's needs
2. Skills must be essential and holistic for youth physically, mentally, socially, and intellectually
3. Skills must be equitable for the development of all children and must consist of lifelong learning for all
4. Skills must be transferrable or adaptable to diverse and changing contexts of society and technology

Classifications and dimensions of the skills framework

(1) Skills in future-oriented learning means the ability to perceive and process both abstract and concrete information through investigation, research, experiment, and learning exchange. It involves making connections with prior learned knowledge and forming new meaning, perspectives and experiences and being able to estimate changes for further application, decision-making, and problem-solving in the future.

(1) Living in the future—the ability to adapt to changes and disruptions in technology, digital technology, science, the

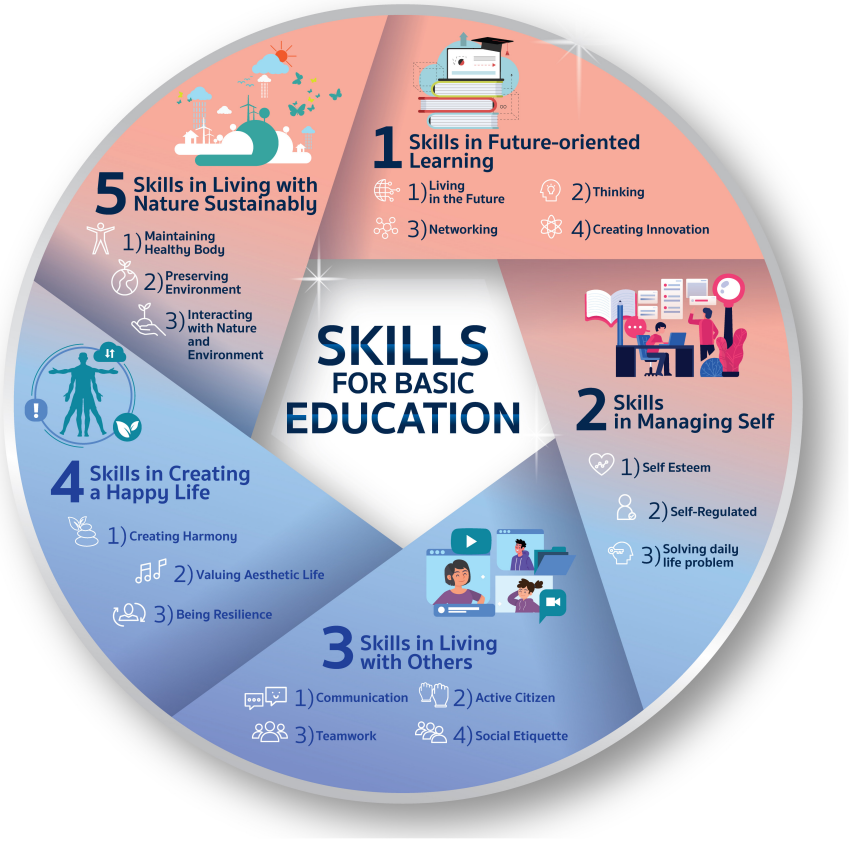

FIGURE 1
Skills framework for students in basic education levels (Buasuwan et al., 2021).

environment, economics, and society; the ability to increase efficiency in and of learning, working and living, yet still able to preserve meaning and valuable ways of human-being.

(2) Thinking—the intellectual ability to process information for situations, reasons, solving problems, making decisions, creating new ideas which comprise foundational thinking skills, intermediate thinking skills, and high-order thinking skills.

(3) Networking—the ability to communicate, connecting groups of people or organizations with common interests, to voluntarily exchange information or learn or do activities together through the free and equal structure of a network organization, underpinned by mutual respect, trustworthiness and empathy.

(4) Creating innovation—the ability to apply knowledge, imagination, creativity, and collaboration to create new things. These can be concepts, approaches, inventions, and products that have value through meeting the needs for solving problems and include entirely new ideas or partially new or new in some contexts or in a particular time period.

(2) Skills in managing self—the ability to understand and perceive value in oneself, to be responsible for one's own life, to develop, control and direct oneself to achieve personal goals, and the ability to service and manage problems or risks faced in the present or future. Skill clusters of this component are:

(1) Self Esteem—the ability to be self-aware and to value oneself, have faith in oneself or clear self-perception, self - worth and self-respect. All of these are processed through self-evaluation of one's abilities and success and expressed through positive attitudes about oneself.

(2) Self-regulation—the ability to improve one's own behavior, to achieve goals that are driven through intrinsic motivation to direct one's own ability and behaviors with mindfulness and determination.

(3) *Solving problems in daily life*—the application of experiences that have been processed through observations, data collection, data analysis, interpretation, and drawing conclusions to solve problems rationally; the ability to ask for help, look for alternatives and make decisions in complex problem-solving or critical situations, appropriately.

(3) Skills in living with others—the personality, behaviors and actions of a person that are expressed explicitly and implicitly through attitudes and social interactions with others and society that are appropriate to the situations, societies, and cultures in which they live. Skills under this component comprise:

(1) Communication—the ability to speak, act and use signs to convey own meanings, feelings and needs as appropriate to target groups, cultures and situations; the ability to receive and interpret verbal and non-verbal language, actions, interactions and symbols, to create shared communication in different contexts effectively and achieve the goals of communication.

(2) Active citizenship—awareness of oneself as a valuable member of a society or a country; having rationales, exercising roles and respecting rules and human rights; being self-responsible and accountable, upholding moral conduct, participating actively and creatively fostering Thai identity and culture; being public-minded and actively participating in society without harming others.

(3) Teamwork—being a good member of the team, having leadership and skills to work in groups; being responsible for one's duties and groups, using one's own strengths to achieve group tasks and helping other group members to achieve shared goals.

(4) Social etiquette—being aware of and applying the verbal and non-verbal expressions and behaviors that are considered by others as being polite in certain contexts and situations.

(4) Skills in creating a happy life—the ability of a person to perceive and appreciate arts, culture, music, sports and ways of life in diverse social and cultural contexts; the ability to adapt oneself and live with others peacefully and the ability to bring one's self back from a critical condition or hardship to a normal state of mind and life. Skills under this category are:

(1) Creating harmony—actions that lead toward the balance of living together which comprises equilibrium of body, mind, society, and environment. In other words, actions that contribute to equity and to the peaceful mind of each individual. This involves respect for each other, understanding each other and living together with differences and in solidarity, using peaceful means to solve conflicts and social problems.

(2) Valuing the aesthetic life—appreciation for values of life, nature and creation which are associated with emotions and the mind, including perception of and appreciation for one's own beauty and living a way of life that has value to one's self, others and wider society.

(3) Being resilient—when facing trauma, disappointments, failures, hardship, or critical situations in life that are not controllable, the ability to quickly find a way back to a normal state of mind.

(5) Skills in living sustainably with nature—giving importance to living and growing with nature sustainably by taking care of oneself in relation to one's surroundings and environment; not harming the environment or nature and living with nature interdependently through caring for one's own health in relation to nature; having awareness of environmental conservation, managing waste and energy efficiently and responsibly as a way of life. Skills under this component are:

(1) Maintaining a healthy body—taking care of one's own health in daily life, keeping hygiene and a healthy way of life, and living in harmony with nature.

(2) Preserving the environment—consuming natural resources mindfully and intelligently; decision making and actions that cause least harm to the environment and seeking equitable access to natural resources.

(3) Interacting with nature and the environment—living with nature; the ability to live with nature without

accommodation; a sufficient way of life; maintain the ecosystem and being mindful of the interdependency between the human and natural environment.

Policy recommendations and guidelines for implementation

These proposed recommendations and guidelines are drawn from the consultation conducted with experts and the steering committee.

1. Applying the skills framework to the national core curriculum of basic education

Since the Basic Education core curriculum provides an educational framework for all learners, the skills required by society and stakeholders may be wide-ranging. Therefore, core competencies should be identified to focus on key areas of abilities to be developed. However, educational and learning management can be designed to meet individual learners' contexts, needs, and potential. Teachers can choose to apply the necessary skill frameworks to connect with or fulfill their Students' learning needs.

2. Extending the skills framework to the revision of the national core curriculum (competency- based)

2.1 Abilities to develop the skills necessary for learners need to be included in the initial teacher training program and need to be in line with competency-based teaching and learning. E-training platforms and hybrid training modes should be considered to maximize the reach of teachers.
2.2 The assessment guidelines and tools for the framework should be developed to support the implementation of a competency-based curriculum
2.3 A mentoring system is essential for implementing the skills framework and competency-based courses.
2.4 The skills framework team should prepare guidelines for working with the competency-based curriculum team for further submission to the OBEC executives.

3. Expanding the skills framework to an overview of the education management system

The skills framework underpinning Basic Education could also form the basis for broadening the education system more generally, as follows:

3.1 The framework can be linked to core competencies. The 170 skills corresponding to the core competencies can be applied to support the design of learning management to improve learner competency.
3.2 The framework provides a comprehensive list of competencies that learners need and can be modified as required by the changing context.
3.3 The required framework can lead to the broadening of the educational system. For example, it could provide a linkage framework for early childhood learning management, for vocational training at the higher education level, as well as providing a basis for skills needed in the labor market of the future.

4. Communicating and creating a partnership with stakeholders and key partners

4.1 A "case for change" needs to be drafted explaining why and how the skills framework and competency-based curriculum are vital for young people in meeting the challenges of the twenty-first Century. This can be done through a strategic partnership with professional associations, both public and private, and NGOs.
4.2 The skills framework and competence-based curriculum teams should continue to work alongside each other, through working committees under the guidance of the steering committees constituted by the key relevant partners.
4.3 Wider partnerships should be sought with both local and international organizations for mutual assistance, knowledge, resources, and information sharing as well as sharing of lessons learnt.

Discussion

Envisioning a skills framework: Meeting sustainable development goal 4 and twenty-first century demands

The central aim of the skills framework for Basic Education in Thailand was developed to prepare Thai learners to have a good life both in the present and the future and to be prepared for unexpected future challenges. Faster technological changes often translate to faster changes in society and greater unpredictability in the form of what is referred to as VUCA,[9] which was expedited by the COVID-19 pandemic. What further changes may come remains to be seen but the unpredictability of the challenges that will arise has implications for the development of twenty-first century skills. A participatory approach was adopted to explicitly address the need to

9 The acronym VUCA has often been used in leadership theories (see Horney et al., 2010). Volatility is the liability of something to change rapidly and unpredictably. Uncertainty relates to the quality of information one has—or the degree to which the outcome of an event is knowable in advance. Complexity increases When there is a more significant number of relevant variables or inter-relationships; the more variables, the more complex the situation. Ambiguity occurs when an event, situation, or context is unclear, either because the information is missing, inconsistent, contradictory, or obscured in some way.

include young people who are the ones who will face this unpredictable future.

As revealed in this study, the skills framework reflects common global skills such as critical thinking, creativity, innovative skills, life and career skills, media and technology skills, and interpersonal and intrapersonal skills. The five dimensions comprise (1) skills in future-oriented learning, (2) skills in managing self, (3) skills in living with others, (4) skills in creating a happy life, and (5) skills in living with nature sustainably. These go beyond foundation skills but also involve all aspects of a child's life including metacognition skills and soft skills/transversal skills. These are important both in the present and for the future and are emphasized in various global skills frameworks (Mitsea et al., 2021).

The framework described in this paper shares the same vision underpinning other major international organizations that advocate paying attention to skills for achieving desirable wellbeing. For individuals, wellbeing is multi-dimensional and complex, and involves both objective material components and psychological factors. In PISA (2018), adolescents' wellbeing was defined as "the quality of Student's lives and their standards of living" and included life satisfaction, self-related wellbeing, wellbeing in schools, and wellbeing outside schools (Organisation for Economic Co-operation and Development [OECD], 2019b, p. 42). Many find these social-emotional skills helpful in achieving positive life outcomes (Guo et al., 2021). The Dare to Dream Poll and Center for Global Education [CGE] (2017) similarly demonstrate that the aspirations of young people are not confined to the workplace. Employability skills sets are no longer enough to fulfill individual wellbeing and young people often have a far wider and more global vision in which environmental management and survival are central.

The "global competence" proposed by Organisation for Economic Co-operation and Development [OECD] (2019a) as a means to prepare Thai youth for an inclusive and sustainable world is also reflected in the framework. Skills such as appreciating others' world views and perspectives; engaging in open, appropriate and effective interaction with people from different cultures; and acting for collective wellbeing and sustainable development are incorporated into the skills dimension of living with others. Lifelong learning, which is not entirely new, is increasingly relevant to the present and future life of youth and plays a key role in the skills dimensions of future-oriented learning.

The recent pandemic has also directed the attention of various agencies to emerging skills requiring more emphasis. These include flexibility and adaptability, leadership, tech savviness, creativity, and innovation (Stephanie, 2022). In addition, to shed light on the skills required for Thai workers after Covid 19, the Thailand Education Fund revealed that creative and imaginative labor are needed in order to become a "Smart Thailand." As well as the abilities required to achieve these goals, there needs to be a return to the fundamental skills e.g., reading skills, emotional abilities, and social skills of working age (Equitable Education Fund [EEF], 2022). All the above-mentioned skills are integrated into the overall dimensions of the skills framework.

Stakeholders and children and youth voices: Common interests, different focus

As revealed in this study, a participatory approach with broad sector public engagement allows diverse needs and voices of stakeholders to be captured. In particular, the approach described here enabled the voices of children and youth in different contexts to be heard. Through consultative processes, high-level policymakers, key stakeholders, and key social influencers were also engaged in the drafting process. Their input was central to refining the framework in order to meet national development goals and future global demands. It was also important in order to ensure their engagement in the adoption and implementation of the framework. Reaching consensus on the skills to be focused on, however, is a key challenge in terms of influencing policy decision-making and policy implementation. This is particularly so in terms of engaging with the central stakeholders: the young people themselves.

Based on the findings of the workshops and Dare to Dream polls, skills items perceived as necessary differ according to stakeholders' values, contexts and backgrounds. All stakeholder groups concurred that innovative thinking skills, problem-solving, self-management, financial and digital literacy, entrepreneurship, foreign languages and communication, and emotional and stress management are urgently needed. These skills involve metacognition and transversal skills which include cognitive and socio-emotional skills and are included in various global skills frameworks (e.g., Organisation for Economic Co-operation and Development [OECD], 2019a; United Nations International Children's Emergency Fund [UNICEF], 2019; United Nations Educational, Scientific and Cultural Organization [UNESCO], 2019).

The survey results were intended to reflect a broader range of respondents. Yet the skills identified as most important were not substantially different. Skills that were highly prioritized centered around researching, creating innovation, doing online business, using e-money, creating online social networks and entrepreneurship. These skills reflect the future of work and a way of life where digital technology will be a key driver. The boom of digital businesses related to big data and artificial intelligence in many countries (see Bardak et al., 2017) is driving the interest in integrating ICT skills into the curricula. Respondents in the education sector like education supervisors, teachers and school administrators, emphasized higher levels of need in overall skill items. However, young people themselves were less likely to emphasize skills gap enhancement. They gave less importance to items related to social and emotional skills or

to values and qualities such as gratitude, honesty and generosity. These have been viewed as core values of Thai culture and are highly emphasized in current Thai education policy. These differences in skills perceptions and demands will be a challenge to the implementation of skills education in Thailand. There is currently a gap between education providers and youth as the central stakeholders, being the recipients of education. "The Bad Student" is one example of youth-led protest groups that continue to shake the country for reform from the classroom up since August 2020 (Rawnsley, 2021).

The polls reveal the importance that young people attach to quality of life. Lack of financial resources and a lack of confidence in one's abilities were seen as potentially preventing them from achieving their life goals. These factors deserve more attention. Using Bourdieu's (1986) forms of capital, one can see that financial capital is considered a significant obstacle, particularly for male youth, while human capital or personal abilities were perceived as the biggest obstacle to success for females. Most female respondents reported a lack of confidence about achieving the future they wanted while their male counterparts felt more confident about their chances of doing so. These perceptions require skills that will contribute to forming a new perspective and mindset, ones that can guide youth toward achieving their life goals and creating a meaningful life.

Almost half of the Dare to Dream respondents said that schools had not sufficiently equipped them with these skills. The message was that schools should urgently improve in terms of providing a hands-on learning experience for youth, enhancing youth' skills through outside classroom activities and reducing the emphasis on written examinations. They expect the outcomes of schooling to go beyond traditional learning where most learning activities take place in a classroom setting. Instead, they demand authentic experiences that prepare them for a good life, a good job and active citizenship through which they can transform society. Such ideas are not new. Indeed, recognition of current limitations are efforts to revise the National Core Curriculum from a standard-based to a competency-based curriculum (see Thummaphan et al., 2021). The wishes expressed by young people in this research are very much in line with SDGs: they want secure jobs and income; they also wish to live in peaceful and harmonious society; and they aspire to a sufficient and sustainable life.

Young people's increased participation in politics and social movements indicates their concern for their prospects and wellbeing and their wish to partake in decision-making that concerns them. In this regard, it will be important to include skills for active citizenship, one of the three desirable outcomes of education stipulated in National Education Standard B.E.2561 (Office of Education Commission [OEC], 2018), in the revised framework. Views on active citizenship remain diverse, however, and agreeing on what the skilled characteristics should be in this regard will be a challenge. While policymakers emphasize nationalism as essential, the younger generations tend to have a more global perspective.

The framework discussed in this paper also reflects common global twenty-first century skills with slight differences in emphasis. Research, innovation and skills related to the future of work are seen as top priorities by all stakeholder groups. However, while mindfulness, gratitude and respect for elders are seen as important by education providers and older generations, they are less valued by young people. There are also youth movements who are demanding cultural changes to the patronage system of "*phu yai*," which means an older person or refers to an important person in Thai society (Isoux, 2020).

Conclusion

Rapid changes and increasingly global challenges have called for global partnerships to reflect the demands for twenty-first century skills and promote the importance of children's living conditions and quality of life around the world. Many countries have introduced global skills frameworks as guidelines for education policy. Thailand, although on the surface a homogenous country, has a range of values and ways of life. More importantly, children and youth who are the most affected by education policy, are often ignored in decision-making. The participatory approach adopted for this study captured diverse needs and contexts. In particular, young people's ideas about their skills needs and educational values were elicited through a range of participatory activities. This approach embraces diversity, inclusivity and equity, so important to achieving the quality education that is at the center of SDGs. The proposed skills framework for Basic Education in Thailand is far-reaching and comprehensive. It embraces global skill frameworks to meet the demands of the twenty-first century; it supports global commitments to SDGs while also reflecting Thailand's national context and the diverse needs of its stakeholders, especially its young people. The five skills dimensions include not only transversal skills and lifelong learning but also qualities that can be seen as particular to Thai society. It encompasses the five skills a future workforce will need in order to cope with global challenges. In addition, Thai cultural values and ways of life, e.g., being grateful, considerate, respectful of adults, mindful and living an easy way of life, are central to Thai culture; it will remain important to preserve these.

The primary goal of developing a skills framework was to be comprehensive and contextualized. The framework is intended to reflect and embrace the diverse needs of young people so that it is inclusive, participatory and can be implemented in diverse contexts. Although Thai children and youth share a vision of Thailand becoming a prosperous nation, they are also challenging some of its core values. As emphasized in the principles and aims, the skills framework discussed in this paper is designed to be comprehensive yet flexible, applicable, adaptable, and relevant to every child. It hopefully reflects the aspirations and dreams of its young people in the context of a changing environment and unpredictable future.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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