Supporting STEM Career Transitions for Girls in ASEAN

SPOTLIGHT ON CAMBODIA, INDONESIA, AND VIET NAM

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Acronyms and abbreviations

ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
CSR	Corporate social responsibility
COVID-19	Coronavirus disease 2019
CSO	Civil society organization
ECE	Early childhood education
ICT	Information and communication technology
Industry 4.0	The fourth industrial revolution
IT	Information technology
ITU	International Telecommunication Union
KAPE	Kampuchea Action to Promote Education
MoET	Ministry of Education and Training (Viet Nam)
MoEYS	Ministry of Education, Youth and Sport (Cambodia)
NEET	Not in education, employment or training
OECD	Organisation for Economic Co-operation and Development
PISA	Programme for International Student Assessment
STEM	Science, technology, engineering and mathematics
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UNICEF EAPRO	United Nations Children's Fund, East Asia and Pacific Regional Office
WAGGGS	World Association of Girl Guides and Girl Scouts
YCAB	Yayasan Cinta Anak Bangsa

Executive summary

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Science, technology and innovation have a vital role to play in today's world and are integral components of all economies in ASEAN. Advances in STEM (science, technology, engineering and mathematics) are driving improvements across all aspects of life, from healthcare and agriculture, to infrastructure and renewable energy. STEM education is also crucial for preparing students for the world of work, enabling entry into STEM careers of the future.[1]

However, girls and women are underrepresented in STEM fields globally, including across the ASEAN region. Only 29.3 per cent of the world's researchers are women, and this drops to 23.9 per cent for East Asia and the Pacific.[2] Among younger age groups, the OECD's Programme for International Student Assessment (PISA) – which measures 15-year-olds' ability to use their reading, mathematics and science knowledge and skills to meet real-life challenges – found recently that in OECD countries, only 14 per cent of girls who were top performers in science or mathematics expected to enter a professional field in science and engineering, compared with 26 per cent of top-performing boys.[3] The period of adolescence is a critical phase in these STEM pathways, as it is when girls and boys decide whether to engage with STEM subjects and pursue STEM careers.

This report explores how to effectively support adolescent girls across the ASEAN region, so that they can transition from education into STEM careers. It explores the factors that influence girls' participation in STEM; the role of key stakeholders in inspiring girls; the approaches that effectively support girls' participation; and the roles key actors can play to encourage girls to pursue STEM fields. The report is based on desk research pertaining to the wider ASEAN region, and primary research conducted in three 'focus' countries: Cambodia, Indonesia and Viet Nam. The primary research included key informant interviews, online workshops and an online survey with girls aged 15 to 19 years old.

[1] ASEAN Science, Technology and Innovation, 'Overview'. <https://asean.org/our-communities/economic-community/asean-science-technology-and-innovation/>; United Nations Educational, Scientific and Cultural Organization, Cracking the Code: Girls' and Women's Education in Science, Technology, Engineering and Mathematics (STEM), UNESCO, Paris, 2017; United Nations Educational, Scientific and Cultural Organization, STEM Education for Girls and Women: Breaking Barriers and Exploring Gender Inequality in Asia, UNESCO, Paris, 2020; West, M., Kraut, R., Han, E.C., I'd Blush If I Could: Closing Gender Divides in Digital Skills Through Education, UNESCO, Paris, 2019.
[2] United Nations Educational, Scientific and Cultural Organization Institute of Statistics, 'Women in Science', Fact Sheet No. 55, 2019.
[3] Organisation for Economic Co-operation and Development PISA statistics cited in UNESCO, STEM Education for Girls and Women: Breaking Barriers.., 2020.

KEY LEARNINGS

Learning 1: Public education systems in the ASEAN region are struggling to provide adolescents with the high-quality STEM education and inspiration needed to stimulate their interest or motivate them to pursue STEM fields.

- Challenges within the education system relate to, among others, ensuring that curricula are up-to-date with dynamic labour market needs; that students are exposed to learning opportunities in a relevant and engaging way; and that they have access to STEM equipment (e.g., digital tools and devices, lab equipment); and career counselling services.
- Factors including geography, infrastructure, and household income intersect and exacerbate challenges within the education system – for example, young people who live in rural areas, in low-income households and those with limited electricity and internet access are most marginalized.

Learning 2: Girls often lack both the belief that they belong in STEM spaces and the confidence to pursue STEM careers.

- The aspirations that girls develop and the career options that they have, or perceive they have, are relatively limited. These options largely fit gendered stereotypes of what is appropriate for girls and women, and have clear associations with caregiving, domestic and lower-skilled roles.
- The limited range of career aspirations may partly be due to perceptions that girls don't have the right to 'dream big', or to lacking knowledge or information about the available pathways for other 'non-traditional' career options.
- Girls often have broader motivations when they are developing their career aspirations, which could be leveraged to frame STEM career options in a more appealing way. Such motivations include serving their family, community and wider society through their career choices.

Learning 3: Girls' aspirations, and their interest and engagement with STEM fields, are heavily influenced by sociocultural norms upheld by family, peers and the wider community.

- Children across the region are often raised to believe women's primary role is within the home and that STEM fields are inherently masculine. Thus, boys and men are considered better suited to such fields than girls and women. This is reinforced by a lack of female STEM role models in the media or wider society.
- Negative family or community perceptions of girls' participation in STEM can limit the social and/or financial support needed for girls to progress in these fields.
- These social norms may also limit girls' STEM career options, as some employers similarly subscribe to the view that men are better suited to STEM fields.

Learning 4: Parents/guardians and teachers have the greatest influence over girls' career pathways, but they tend to lack the knowledge or motivation to inspire girls' STEM career aspirations.

- Many jobs within the STEM space are relatively 'new' and unfamiliar, which means parents/guardians and teachers are less likely to be aware of them, and therefore to recommend them, to either girls or boys.
- Parents/guardians and teachers are even less likely to recommend STEM career options to girls, as they are often influenced by wider social norms that imply STEM careers are not well suited to girls or women.
- Teachers often lack the knowledge to engage adolescents, and especially girls, in STEM fields. Knowledge gaps include STEM pedagogy; digital literacy; awareness of STEM gender stereotypes; gender-responsive STEM pedagogy; and capacity to provide career counselling for girls or boys.

Learning 5: Approaches that effectively support adolescent girls to participate in STEM aim to improve the delivery of STEM education, raise awareness of STEM career options and frame STEM fields in ways that are appealing to girls and that dispel negative gender stereotypes.

- **Ensuring STEM education addresses the specific needs of girls and prepares them for STEM careers:** Approaches that make STEM education practical, fun, relevant to girls and that are gender-responsive are important to effectively engage and inspire girls to participate in STEM. Offering STEM learning opportunities outside school settings is also valuable, especially for girls, since such opportunities are typically limited.
- **Raising awareness of STEM fields and framing them in ways that are appealing:** Approaches perceived by girls to be most important in supporting their participation in STEM include offering female role models and mentors, industry experience, and scholarships and financial support.

Learning 6: Various actors are engaging in activities to support young people's – and in some cases, specifically girls – participation in STEM, but a larger, systematic and holistic approach is lacking, which therefore raises the risk of duplication of effort, gaps in support and inefficiency overall.

- Governments, education institutions, CSOs and industry actors are employing a range of models and approaches to support the participation of young people, and specifically girls in some cases, in STEM.
- While these actors engage in a variety of collaborations, partnerships and programmes, the overall approach is largely fragmented, with some actors operating in siloes. This needs to be addressed at the national, regional and global level.
- To address this at the national, regional and global level, a larger, more comprehensive solution – an 'ecosystem' approach, where the roles of different actors are clarified and defined within a coordinated, coherent framework – would be valuable.

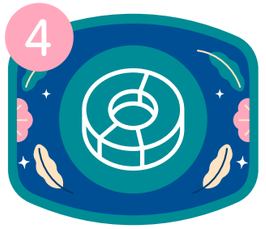
OPPORTUNITIES FOR ACTION

The following are five opportunity areas for actions to effectively support adolescent girls across the ASEAN region to transition into STEM careers:

Develop a holistic 'ecosystem' approach, where actors work to complement, collaborate and learn from each other's activities in order to avoid working in siloes, and to foster coherence and efficacy. This will require one actor to play the role of 'convener' and the roles of other actors to be clarified, communicated and coordinated.

Develop social and behavioural change strategies to engage key stakeholders, especially parents/guardians and teachers, in supporting girls' STEM career aspirations.

Support efforts to improve STEM education within public education systems and non-formal education systems, and through extracurricular programming.



Leverage models and approaches that effectively raise girls' awareness of STEM career options and help to make STEM pathways appealing and accessible to them.

Build an evidence base to cover the wider ASEAN region, address data gaps around demographic sub-groups, and to explore the effectiveness of new models and approaches.

Introduction

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The Fourth Industrial Revolution (or 'Industry 4.0') is changing the face of the global economy and labour market needs. With the introduction of artificial intelligence and automation, jobs have been transformed across a wide range of sectors, including manufacturing and services.[4] Rapid digitalization and adoption of new technologies mean that STEM fields are increasingly central to the global economy, and STEM skillsets are ever more important within the wider labour market. This is reflected across the ASEAN region where, for example, up to 80 per cent of jobs will require basic digital literacy and applied ICT skills by the year 2030.[5]

In recognition of this, ASEAN member states adopted the Declaration on Industrial Transformation to Industry 4.0, in 2019. This commits them to a range of actions to support the transition to Industry 4.0,[6] including prioritizing STEM as a key component of national human and economic development. Indonesia's 2045 vision, for example, emphasizes human development and the advancement of science and technology as the central pillars to improve quality of life and economic productivity.[7]

As the economy shifts and labour market needs continue to change, there is a risk that girls and women across the ASEAN region – who are already disproportionately disadvantaged in terms of access to economic opportunities and resources – will be further left behind, greatly increasing the existing gender divide. This is partly because sectors where women predominate, such as retail and wholesale, are expected to be heavily impacted by changes brought on by Industry 4.0, leading to an overall decline of jobs in these sectors.[8] However, it is also because girls and women are currently underrepresented in STEM fields. For example, only 29.3 per cent of the world's researchers are women, and this drops to 23.9 per cent for East Asia and the Pacific.[9]

Girls and women leave STEM disciplines in disproportionate numbers during secondary and tertiary education, during transition to the world of work, and during the career cycle.[10] In Cambodia, for example, only 16.68 per cent of STEM graduates are women.[11] These figures vary somewhat across the region, as demonstrated in Thailand and Viet Nam, where 31.14 per cent and 36.51 per cent of STEM graduates are women respectively.[12] Still, the numbers highlight clear gender gaps in relation to progression along STEM pathways.

Adolescence is a particularly crucial period, as it is when girls and boys decide whether to engage with STEM subjects and pursue STEM careers. This is also when girls' interest appears to drop, and they begin to opt-out of STEM disciplines. Research conducted with over 2,000 girls in the Asia Pacific region found that 68 per cent of 12 to 14-year-olds reported that they found the field interesting overall, and 50 per cent of 15 to 19-year-olds had considered STEM subjects when they were younger. However, the study also found that 51 per cent of girls aged 15-16 years old then changed their minds.[13] While the reasons for this change are unclear in the published data, potentially plausible explanations could be related to the fact that, as the study highlights, 66 per cent of respondents aged 12-19 years old found STEM subjects challenging, 35 per cent found science lessons dull and irrelevant for their future pursuits, and 50 per cent of adolescent girls expressed that girls are less likely to pursue STEM-related jobs because of the strong male presence in these jobs.[14]

In addition, there are a range of factors contributing to adolescent girls in the Asia Pacific region being out of school, and therefore unable to participate in STEM education. These factors, many of which are rooted in discriminatory gender norms and practices, include the perceived value of girls' education, financial constraints, mobility constraints, early marriage, pregnancy and domestic care responsibilities.[15]

This report aims to explore how to effectively support adolescent girls across the ASEAN region, to transition into STEM careers. It explores the factors that influence girls' participation in STEM; the role of key stakeholders in inspiring girls; the approaches that can support girls' participation; and finally what key actors can do to support girls to pursue STEM fields. The report focuses on girls aged 15 to 19 years old, however insights based on younger age groups and those who are slightly older have been included where relevant.

[4] The Sasakawa Peace Foundation and Dalberg Global Development Advisors, Advancing Women's Empowerment: ICT Skills for Girls and Women in Southeast Asia, 2017.
[5] Ibid.
[6] ASEAN, Declaration on Industrial Transformation to Industry 4.0, 2019.
[7] SMERU Research Institute, United Nations Economic and Social Commission for Asia and the Pacific, and University of Oxford, Accelerating Digital Skills Development in Indonesia: A Strategy Primer, Jakarta, 2022.
[8] The Sasakawa Peace Foundation and Dalberg Global Development Advisors, Advancing Women's Empowerment..., 2017.
[9] United Nations Educational, Scientific and Cultural Organization Institute of Statistics, 'Women in Science', Fact Sheet No. 55, 2019.
[10] UNESCO, Cracking the Code..., 2017.
[11] World Economic Forum, Global Gender Gap Report: Insight Report, Geneva, 2022.
[12] Ibid.
[13] Mastercard, 'Enthusiasm for STEM Sparks Early Amongst Girls in Asia Pacific: Mastercard Research', Singapore, 9 February 2018.
[14] Ibid.
[15] United Nations Educational, Scientific and Cultural Organization, Situation Analysis of Out-of-School Children in Nine South-East Asian Countries, Bangkok, 2017.

A key point to note regarding this age range is that they are not at a life-stage where they are generally able to transition into a STEM career as yet. This is because many STEM industry employers require a university degree in a STEM subject at point-of-entry, which means that young people are often in their early 20s by the time they are qualified enough to begin a STEM career. A key focus of this report must therefore include how to ensure that girls continue to study STEM subjects, to the point that they can transition into STEM careers.

Box 1. Defining 'STEM'

There are several definitions of 'STEM' and specifically 'STEM education'. This study uses the UNESCO (2020) definition:

"STEM education represents subjects and concepts related to science, technology, engineering and mathematics, either as standalone subjects or interdisciplinary courses. This is a broad interpretation that can apply to many professions or educational programmes."[1]

It is important to note that other definitions often emphasise STEM education as an 'interdisciplinary approach' that "moves beyond simple test performance and focuses on developing higher level thinking skills by connecting classroom learning to the real world."[2] This is certainly the ideal (as highlighted in this report), however the broader UNESCO definition enables a discussion of individual subjects and study tracks, regardless of whether they meet the criteria for these latter definitions.

1 UNESCO, STEM Education for Girls and Women: Breaking Barriers…, 2020.
2 Britannica, 'Learn about STEM education and its unique approach to teaching and learning', Accessed: April 2023.

This report is organized into four chapters:

Chapter 1 outlines the structural, psychological, and sociocultural factors that shape girls' STEM career pathways and aspirations. It demonstrates how these factors – which include education systems, geographical location, infrastructure and household income, as well as gendered social norms and stereotypes – can intertwine to limit girls' aspirations and the support they receive from those around them to participate in STEM. It also highlights how girls often lack a sense of belonging within STEM spaces, and the interest or confidence needed to pursue STEM fields.

Chapter 2 describes the key stakeholders who have influence over girls' career aspirations, and offers suggestions on how to positively engage them in supporting girls' participation in STEM. It emphasizes the particularly influential role of parents/guardians and teachers. A key issue raised is the apparent lack of knowledge or motivation among various stakeholders to inspire and support girls' STEM aspirations. At the same time, however, this can also present opportunities to educate and engage these stakeholders to do so.

Chapter 3 explores the models and approaches that can effectively support girls to participate in STEM and highlights key points to consider when developing them. In particular, it highlights the importance of role models and mentors, industry experiences, and scholarships and financial support.

Chapter 4 examines how key actors can support girls to pursue STEM fields and offers suggestions on different roles and activities. It proposes the introduction of a more coherent 'ecosystem' approach, where one actor plays the role of convener for other actors in the STEM space, in order to enhance coordination between actors, avoid duplication of effort, address gaps in support, and break down siloes that may sometimes exist.

The report concludes by outlining five opportunity areas for action, to effectively support adolescent girls across the ASEAN region to transition into STEM careers.

Methodology

This report used a case-study based, mixed-method research approach, which included desk research, key informant interviews, online workshops with girls, and an online survey with girls.

The first stage involved a desk review of data, studies, literature and online articles referring to girls' participation in STEM across the ASEAN region. Purposive sampling was used to identify sources, with UNICEF sharing several documents for review and the authors selecting additional sources through online searches. These searches were conducted at the regional level using key search terms including 'girls', 'women', 'STEM', 'ASEAN', 'Southeast Asia', 'education', 'careers' and 'jobs', and at the national level by including the name of the country.

For the following stages, three 'focus' countries were selected: Cambodia, Indonesia and Viet Nam. These countries were selected via purposive sampling, whereby the UNICEF Regional Office approached country offices engaged in potentially relevant initiatives, and those that expressed interest in participating were then included in the study.

Key informant interviews were conducted in each of these three countries, and at a regional level, with individuals from relevant government departments, the private sector (STEM industry employers) and civil society organizations (CSOs) involved in supporting girls' participation in STEM. Key informants were selected via purposive sampling and included 26 interviews in total; eight in Cambodia; nine in Indonesia; seven in Viet Nam; and two from the regional level. The interviews focused on enablers of and barriers to STEM education for girls; key stakeholders to engage in inspiring girls; models and approaches that have proven effective; and perceived roles that different actors could play in supporting girls' participation in STEM.

Online workshops with girls were then conducted in Cambodia and Indonesia. In each country, two workshops were held, one in an urban setting and the other in a rural setting. In total, 10 girls in Cambodia, and 12 girls in Indonesia participated. Girls were selected via purposive sampling, using the following criteria:

- Spread between 15-19 years of age
- Enrolled or participating in education or training
- Digital access and ability to use Zoom

These were interactive, co-creative workshops, which aimed to explore girls' career aspirations, perceptions of STEM, and models and approaches that could positively support girls' participation in STEM.

Resource limitations meant it was not possible to conduct workshops with girls in Viet Nam, so an online survey was conducted instead via UNICEF's U-Report platform.[16] This was a short 6-question survey, with several opportunities for open-ended responses.[17]

The sample included 774 girls in total, selected using the following criteria:

- Spread between 15-19 years of age
- All to be in education
- Preferably all to be engaging in a STEM subject

The survey aimed to explore girls' career aspirations, perceptions of STEM, and approaches that could positively support girls' participation in STEM. Descriptive statistics were used to analyse survey data, which were then synthesized with the primary qualitative data and secondary research to develop this report.

STUDY LIMITATIONS

This report aims to provide a snapshot of how to effectively support adolescent girls across the ASEAN region to transition into STEM careers. It is case-study based, and therefore, has a number of methodological limitations and cannot claim to be an exhaustive study of the region.

Regarding the desk research, the authors do not claim to have conducted an exhaustive review of all data, studies, documents and reports relating to girls and STEM across the region. Instead, the purpose of the desk review was to focus on key reports and studies to provide an initial foundation for following stages of research. Additionally, only English-language documents were reviewed.

The 'focus' countries included in the study cannot be considered representative of the wider ASEAN region, as they were selected via purposive sampling, based on UNICEF in-country programmes and interest in participation.

The key informant interviews cannot be considered representative of the focus countries, or the ASEAN region, as purposive sampling was used to recruit participants, and the overall sample size was small.

The workshops with girls in Cambodia and Indonesia cannot be considered representative, or comparable, due to the small sample size and the purposive sampling approach used. Girls were recruited via extracurricular programme providers in both countries, which meant that they may have a propensity towards STEM that is not representative of the wider population who are not involved in such programmes. Additionally, participants had to have digital access and ability to use Zoom, so cannot be considered representative of girls who do not have this access or ability.

[16] UNICEF's U-Report is a digital platform started in 2011 to engage young people in programme priorities, emergency response and advocacy actions. It supports adolescent, youth, and community participation; and works as a tool to share information, raise awareness, and collect quantifiable data on specific areas that impact children, including the most vulnerable. For more information, see https://ureport.in/about/.
[17] The survey script can be found in Appendix I.

LESSONS LEARNED: CONDUCTING WORKSHOPS WITH GIRLS IN RURAL VERSUS URBAN LOCATIONS IN INDONESIA

TECHNOLOGY:

The workshops were conducted over Zoom, however this was challenging, particularly in the rural locations. Girls tended to access Zoom via a mobile phone, which in some instances meant they struggled to see the text and images displayed in PowerPoint on the screen. Additionally, in the rural workshops, connectivity was particularly challenging; connections were quite unstable and girls sometimes struggled to hear, and/or needed to leave and rejoin.

LANGUAGE:

Girls in the urban workshops had a stronger grasp of English, and they also used Bahasa Indonesia. The majority of girls in the rural workshops spoke a local dialect and English terms were not well translated. This meant that girls in the urban workshops could better understand the questions asked – both by local facilitators and English-speaking observers.

AWARENESS OF STEM CAREERS:

Rural versus urban girls' awareness was different, potentially due to differing levels of exposure to STEM in their communities. Rural girls generally perceived STEM careers to involve working as a teacher (e.g., biology or vocational), whereas urban girls perceived STEM careers to involve working in technology start-ups, building robots or artificial intelligence. This could possibly be a consequence of recruiting girls in rural and urban locations via different extracurricular programmes, which offer different or limited exposure to STEM career options.

The online survey in Viet Nam cannot be considered representative, as it was conducted via U-Report. This meant that girls who participated had to have digital access and were already using this tool, and therefore cannot be considered representative of those who did not have access. The findings are also not comparable with the girl workshops in Cambodia and Indonesia, as a different methodology was used.

Finally, this study only focuses on one portion of the STEM 'pipeline', leading up to girls' potential transition into STEM careers. However, multiple studies highlight that STEM pathways begin much earlier than adolescence and thus, issues around girls' participation in STEM also need to be addressed in early childhood.[18] Girls who were not in education, employment or training (NEET) were also not part of the scope of this study, as they were not in the 'pipeline' to transition into a STEM career. The primary challenge, or priority, for these girls must be to get access to education or training in the first place. The authors recommend that it is important to also consider models and approaches that can be effective in supporting younger age groups to participate in STEM, and also more broadly, address barriers faced by girls who are out-of-school and unable to access education or training.

[18] UNESCO, Cracking the Code…, 2017.

Chapter 1:

Key factors shaping girls' STEM career pathways and aspirations

Factors that shape girls' STEM career pathways and aspirations can be split into three groups: structural, psychological, and social. These factors intertwine in a multitude of ways to influence the lives of girls. Using them as overlapping lenses allows us to explore the influence of each group and its relationship with the others, and examine how they can be addressed to better support girls.

Figure 1. Key factors shaping girls' STEM career pathways and aspirations

STRUCTURAL FACTORS

THE PUBLIC EDUCATION SYSTEM

Education systems play a critical role in providing girls (and boys) with access to STEM learning opportunities, and stimulating their interest and motivation to pursue STEM fields.[19] Various components within the system are involved in this, including teachers, learning content, resources, assessment tools and approaches, and the broader learning environment.[20]

Public education systems across the ASEAN region are experiencing various challenges that hinder their ability to play this role for girls or boys. A study conducted with young people aged 10–24 years old in Indonesia, Lao PDR and Thailand found that public education systems are struggling to develop the foundational, transferable, labour market-ready skills needed by young people, or to help them realize their professional aspirations.[21] Key informants interviewed for this report in Cambodia, Indonesia and Viet Nam also highlighted the skills gap that currently exists between what is taught in school versus what is needed in industry.

One challenge involves **ensuring that the curriculum is up-to-date with labour market** needs and exposes students to learning opportunities in a relevant and engaging way. Key informants reported that these were broad issues across the national curricula in Cambodia, Indonesia and Viet Nam, but especially for STEM, in part due to the fast-changing nature of STEM careers and requisite skill sets needed.

Additionally, **STEM education is often still relatively new to national curricula** and may not yet be implemented across the public school system. For example, in Cambodia, key informants from the Ministry of Education, Youth and Sport (MoEYS) highlighted that the national curriculum was over 10 years old and would require extensive investment to update. They observed that STEM education was new to the curriculum and was currently only being piloted in some schools.

STEM education in Indonesia and Viet Nam is also relatively new to the national curricula and not yet implemented nationwide. For example, key informants in Indonesia reported that a new national curriculum was launched in 2022, which introduces STEM education and also aims to support the development of 'twenty-first-century skills', such as critical thinking. However, uptake of the new curriculum is not yet nationwide.[22] In Viet Nam, private education centres began importing STEM programmes from abroad to teach in the extracurricular programmes in some schools in the early 2010s. Since then, STEM education programmes have gained increasing attention from the Government and have begun to spread through different formats and models.[23] The Ministry of Education and Training (MoET) has also introduced a national education framework, which puts greater emphasis on STEM education and outlines essential components that must be included (e.g., 'programming' in ICT). However, provinces are given the autonomy to choose the precise curriculum they use, which can lead to variability across regions.[24]

Challenges with the curriculum are compounded by **a lack of equipment needed to engage with STEM education on a practical level.** For example, in Cambodia, key informants observed that within the lower secondary curriculum, there were only one or two opportunities per year to conduct lab experiments, increasing to just four or five times per year in upper secondary. Key informants from the MoEYS pointed to the lack of equipment as an issue and have developed 67 'secondary resource schools', which have four science labs per school. However, they noted that even in these schools, the equipment that is available is more suited to conducting experiments outlined in school textbooks, rather than sophisticated modern equipment used in STEM industries. Similar challenges were observed by key informants in Indonesia and Viet Nam.

[19] UNESCO, Cracking the Code…, 2017.
[20] Ibid.
[21] United Nations Development Programme and United Nations Children's Fund, Addressing Gender Barriers to Entrepreneurship Among Girls and Young Women in South-East Asia, UNDP and UNICEF, Bangkok, 2021.
[22] United Nations Children's Fund, Girls' Digital Literacy in the East Asia and Pacific Region: Spotlight on Cambodia, Indonesia, Lao PDR and Timor-Leste, Viet Nam, UNICEF, Bangkok, 2023.
[23] Chen, Danying et al., 'STEM Education and STEM-Focused Career Development in Vietnam' in H. T. Tran et al. (eds.). Human Resource Development in Vietnam, 2021.
[24] UNICEF, Girls' Digital Literacy in the East Asia and Pacific Region…, 2023.

There is a significant lack of information within the school environment on STEM learning opportunities or career options. Key informants in Cambodia, Indonesia and Viet Nam observed that opportunities for career guidance at school were limited or non-existent, meaning students tended to rely on family members to learn about their options. A lack of exposure to STEM learning opportunities or awareness of STEM career options early on is problematic. This is partly because students often have to engage in subject selection during their secondary education, and therefore must choose whether to continue studying STEM subjects moving forward. A survey conducted by the World Association of Girl Guides and Girl Scouts (WAGGGS) found that 86 per cent of girls and young women reported they had to choose whether to continue their studies in STEM-related subjects during their adolescence.[25] Key informants in Cambodia, Indonesia and Viet Nam similarly observed that students have historically had to choose between the 'STEM track', which tends to incorporate natural sciences plus ICT, or the 'social studies' track, which usually includes subjects such as languages. In Indonesia and Viet Nam however, informants also expressed that the new curricula aims to ensure that subject selection is no longer required.

When subject selection is required, the STEM study track tends to be selected by only a minority of girls or boys. This is largely because students tend to select their study track based on perceived subject difficulty and likelihood of passing the public examination needed to complete secondary education. Key informants emphasized that STEM subjects are considered to be significantly more difficult than social studies, and therefore a greater number of students choose the 'easier' track, to ensure their greatest chance of completing secondary education successfully.

The dynamics around study track selection are highlighted particularly clearly in the context of Cambodia. Key informants from the MoEYS highlighted that only around 30 per cent of secondary students enrol in the 'STEM science stream'.[26] Additionally, they noted that Ministry statistics do indeed show a higher Grade 12 pass rate among students in the 'social science' stream. Broader issues related to educational attainment and poor academic performance underlie this situation. For example, the most recent PISA (2018) results showed that Cambodian 15-year-old students studying from grade 7 to 12 constituted 28.1 per cent of the total population of 15-year-olds, which suggests approximately 72 per cent of the population had dropped out of school or delayed their schooling by this point.[27] Cambodian 15-year-old students also had significantly lower performance in reading and science than those in PISA member and ASEAN countries (Vietnam, Thailand, Indonesia, and Singapore), with only 8 per cent of 15-year-old students achieving a minimum proficiency (level 2) or higher in reading, and 5 per cent in science.

Against this backdrop, it is perhaps logical that students might choose the 'easier' study track, to ensure their greatest likelihood of being able to complete secondary education successfully. It might also suggest that in contexts where educational attainment and poor learning outcomes are an ongoing issue, STEM subjects may simply be perceived as 'too difficult' for girls or boys to pursue. Addressing these foundational challenges within the broader education system would be essential towards supporting both girls' and boys' participation in STEM fields.

[25] World Association of Girl Guides and Girl Scouts, WAGGGS STEM Consultation Report Launch, 2023.
[26] Disaggregated data – including sex- and age-related – was not readily available for this report.
[27] Ministry of Education, Youth and Sport, Cambodia, 'Education in Cambodia: Findings from Cambodia's experience in PISA for Development', Phnom Penh, 2018.

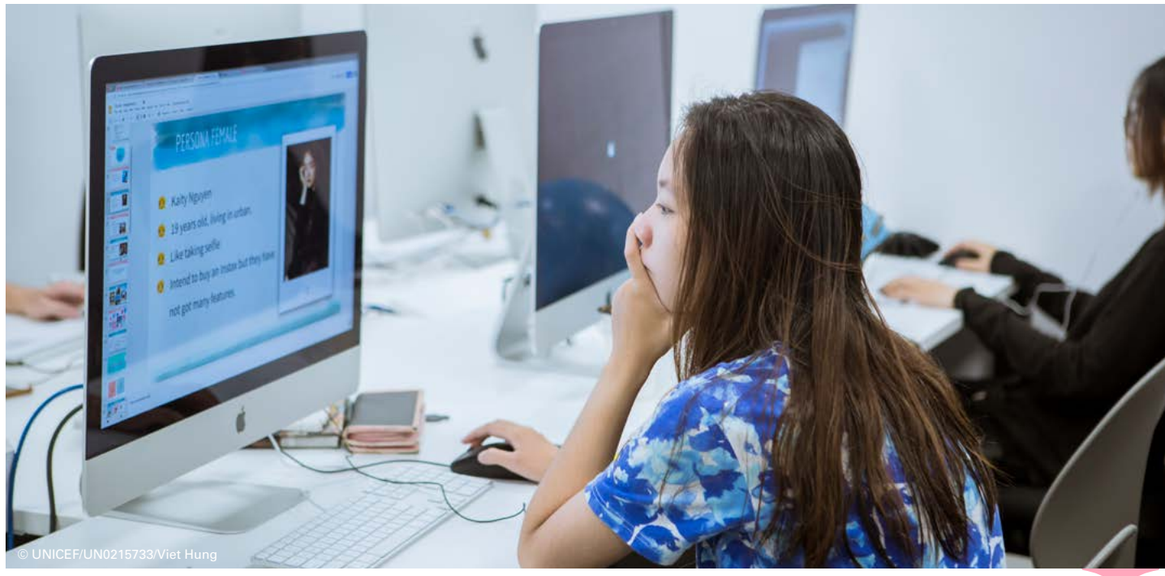
GENDER

Girls' specific STEM learning needs, challenges and barriers are often not perceived to be a necessary consideration within education. This is partly due to a belief that when girls and boys are in school, they have the same level of access to education and education-related opportunities and should thus be treated the same. This belief was reflected by key informants in Cambodia, Indonesia and Viet Nam, and has been identified previously in other studies.[28]

This belief is further reinforced by statistics from across the ASEAN region that show several education-related gender gaps that tilt in favour of girls. For example, statistics show that girls tend to be equal to boys, or advantaged, in their attendance and completion at all stages of school across Southeast Asia.[29] This is particularly evident in Viet Nam, where only 51.4 percent of boys complete upper secondary, compared to 65.0 per cent of girls.[30] In Cambodia, key informants from the MoEYS highlighted that girls also perform better in education and pass the Grade 12 examination at higher rates than boys, regardless of which study track they choose.

However, there is broad recognition of **a gender gap that tilts in favour of boys and men later on, during the transition to STEM tertiary education, and when progressing from education to careers and employment.** This is supported by high-level gender gap data, for example in Cambodia, which shows that girls and women account for at least one-half of all enrolments in university, but not within most STEM areas, and not in postgraduate programmes.[31] This was similarly reflected by some key informants in Cambodia, Indonesia and Viet Nam, who reported that it is at these stages where differences between girls and boys arise in relation to STEM.

These types of high-level statistics may therefore mask some of the more subtle gender differences taking place during adolescence regarding how girls and boys learn to relate to STEM subjects and career options. As a consequence, while there appears to be general recognition that STEM career aspirations are an issue for girls, how or when this issue needs to be addressed seems to be less clear to some stakeholders, particularly in relation to younger age groups who are still in education.



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[28] UNICEF, Girls' Digital Literacy…, 2023.
[29] United Nations Children's Fund, Gender Counts: A Quantitative Assessment of Gender Inequality and its Impact on Girls and Boys in East and Southeast Asia, Bangkok, 2019.
[30] United Nations Children's Fund, 'Viet Nam SDGCW Survey 2020-2021: Education', 2021.
[31] Bunry, R. & Walker, K., 'Cambodian Women and Girls: Challenges to and Opportunities for Their Participation in Higher Education', in McNamara, V. and Hayden, M. (Eds.), Education in Cambodia: From Year Zero Towards International Standards, (Singapore), 2022.

GEOGRAPHY, INFRASTRUCTURE AND HOUSEHOLD INCOME

Factors including geography, infrastructure, and household income intersect and exacerbate challenges with the education system. These were often perceived by key informants, and girls themselves, to have a greater impact on young people's engagement and participation in STEM fields than gender.

"I WANT TO BE AN ENGINEER – TO DO THIS I NEED TO STUDY AT A UNIVERSITY IN PHNOM PENH. MY CHALLENGES WILL BE ACCOMMODATION AND FINANCES - TO PAY FOR STUDY AND ACCOMMODATION IN PHNOM PENH."

GIRL WORKSHOP PARTICIPANT, CAMBODIA, 16, RURAL

The geographic location in which girls and boys live impacts their ability to access quality STEM learning opportunities and career options. Key informants in Cambodia, Indonesia and Viet Nam emphasised that in rural areas, and on islands outside of Java and Bali in Indonesia, both girls and boys had far lower access to high quality education or career options, particularly for STEM fields. For example, in Viet Nam, public schools in urban areas often have facilities to teach STEM subjects and students have extracurricular opportunities, in the form of after-school clubs and ICT training centres in the community. Conversely, in rural areas and poorer provinces, schools tend to have outdated curricula and teaching methods, limited or in some cases no STEM facilities and fewer extra-curricular opportunities.[32] Similarly, in Indonesia, students not from urban areas or the islands of Java and Bali, often have to travel large distances to go to school. Rural schools also tend not to be as well-equipped as those in urban locations, or to use the most up-to-date curricula. In Cambodia, although the number of provincial tertiary institutions have increased, they often do not offer STEM course options and it is difficult to recruit STEM teachers in rural areas, as there are better opportunities for them in the capital, Phnom Penh. This issue was similarly highlighted by girls in the Cambodia workshops, who observed that if they wanted to progress to a STEM major at tertiary level or participate in a STEM career, they would need to relocate to the capital.

A lack of infrastructure can also prevent girls, and boys, from accessing information about STEM fields and using STEM equipment, such as internet-enabled digital devices. This was observed by key informants in Indonesia especially, who said that rural areas and islands outside Java and Bali often did not have consistent access to electricity or the infrastructure to support mobile connectivity and broadband internet. Similar issues were highlighted by key informants in Cambodia and Viet Nam, who noted this as a key barrier in rural areas and the mountainous regions of Viet Nam.[33]

Household income can impact girls' and boys' ability to access education and progress on STEM career paths. Educational completion rates tend to be much lower for children in poorer households than among those that are wealthier. For example, recent analysis conducted by the World Bank in Viet Nam found that by age 19, only a fifth of students from the poorest 20 per cent of households remained in school, compared with 80 per cent of those in the wealthiest 20 per cent.[34] Household expenditure on education also varied widely between richer and poorer households. For example, spending on extracurricula courses was 5.6 times higher among the richest households than among the poorest.[35] These differences in educational expenditure can translate into differences in educational completion rates, which in turn affect future employment and economic opportunities, including in STEM fields.

[32] This finding was similarly reflected in UNICEF, Girls' Digital Literacy…2023.
[33] This finding was similarly reflected in UNICEF, Girls' Digital Literacy…2023.
[34] Bao, A, T. and Yang, J., 'Reducing gaps in education remains important in Vietnam as new school year kicks in', World Bank Blogs, 7 September 2022.
[35] Ibid.

"I WANT TO BECOME A DOCTOR, SO I NEED TO STUDY MEDICINE FOR 8 YEARS. MY CHALLENGES ARE FINANCIAL – MY ABILITY TO FUND MY EDUCATION."

GIRL WORKSHOP PARTICIPANT, CAMBODIA, 18, URBAN

"I WANT TO BE A DOCTOR, IT IS ONE OF MY DREAMS, SO I THINK ABOUT THIS A LOT. MY CHALLENGES ARE ON FUNDING, AND TIME. ON THE FINANCIAL MODALITY, WE HAVE TO FIND WAYS TO HELP PARENTS, SO WE HAVE TO FIND CHANNELS TO BE ABLE TO PAY THE FEE AS SMALL AS WE CAN."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 18, RURAL)

Household income has been highlighted as a significant challenge by girls themselves across the region. For example, research conducted with young people aged 10–24 years old in Indonesia, Lao PDR and Thailand found that family financial constraints were a key barrier to young women pursuing higher education or skill-building opportunities.[36] Key informants across Cambodia, Indonesia and Viet Nam observed that this issue was magnified for many STEM career options due to the requirement for further study at tertiary level. Advanced education fees can be costly, and there is an opportunity cost, as such education takes additional time. In the workshops in Cambodia and Indonesia, girls who wanted to pursue STEM careers highlighted finances as a primary barrier to this endeavour.

PSYCHOLOGICAL FACTORS

SELF-IDENTIFICATION WITH STEM; INTEREST AND CONFIDENCE TO ENGAGE WITH STEM

Decisions to pursue STEM fields are influenced by the way that girls (and boys) perceive themselves, their level of interest in STEM, and confidence in their personal ability. **Young people must feel they belong within STEM spaces, be interested in the field, and feel confident in their ability to engage with it successfully.** Thus, the attitude a girl has toward STEM plays a key role in her STEM education and career choices; when girls lack interest, confidence and belief that they can succeed, they are less likely to pursue STEM fields.[37]

As girls go through different developmental stages, the importance of different psychological factors vary to some extent. Girls in early and mid-adolescence are still very much in the process of developing their sense of identity, so it is important at this stage that they learn that STEM fields can be interesting, relevant and accessible to them. As girls progress into mid-adolescence, it is crucial that they develop confidence in their ability to participate in STEM and feel motivated to pursue STEM careers.[38] This is particularly important because around mid-adolescence, students are often required to choose whether to continue studying STEM subjects in school. As girls progress into late adolescence and enter early adulthood, they need to feel that they belong in STEM spaces and these careers are accessible to them, despite both often being male-dominated.[39]

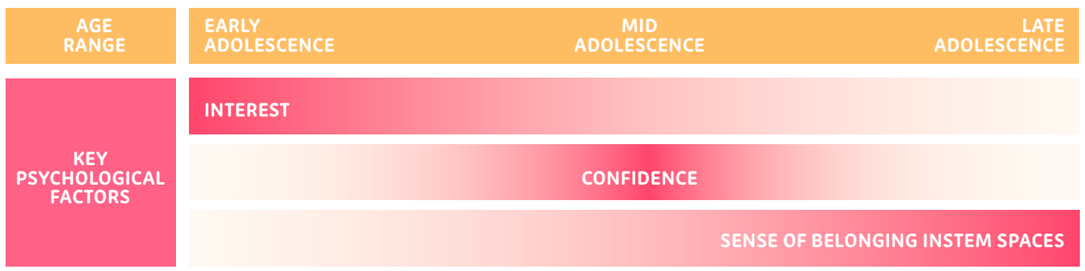


Figure 2. Key psychological factors by age range

[36] UNDP and UNICEF, Addressing Gender Barriers to Entrepreneurship…2021.
[37] Dasgupta, N. and Stout, J. G., 'Girls and Women in Science, Technology, Engineering, and Mathematics: STEMing the Tide and Broadening Participation in STEM Careers', in Policy Insights from the Behavioural and Brain Sciences, 1(1), 21-29, 2014; UNESCO, STEM Education for Girls and Women: Breaking Barriers…, 2020.
[38] UNESCO, I'd Blush If I Could…, 2019; UNESCO, STEM Education for Girls and Women: Breaking Barriers…, 2020.
[39] Boccuzzi, E., and Uniacke, P., Accelerating Women's Advancement in STEM: Emerging Lessons on Network Strategies and Approaches in Asia, The Asia Foundation, 2021.

"CONFIDENCE IS A CHALLENGE FOR THESE TYPES OF JOBS. YOU HAVE TO HAVE A LOT OF PASSION, BE CREATIVE AND INNOVATIVE."

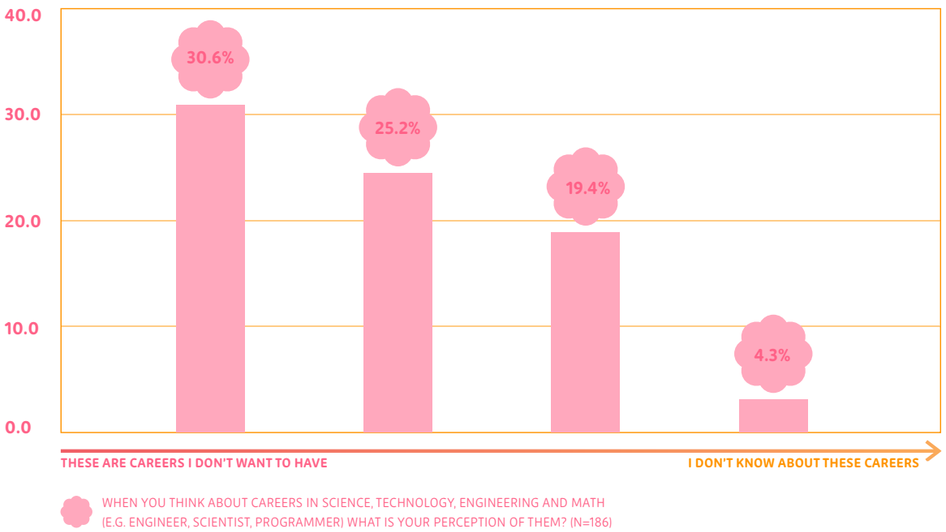
(GIRL WORKSHOP PARTICIPANT, CAMBODIA, 17, RURAL)

Girls often do not believe that they have the inherent capacity to engage with STEM, which is related to their lack of interest and confidence to pursue STEM further. The International Computer and Information Literacy Study (ICILS) 2013 assessment, which was conducted in 21 countries including China, Hong Kong, the Republic of Korea and Thailand, showed that despite performing similarly to boys on measures of digital skills in primary and lower secondary education, girls had lower levels of self-efficacy (confidence or self-perceived ability).[40] Key informants in Cambodia, Indonesia and Viet Nam who supported girls through extracurricular STEM programmes similarly observed that although girls' STEM proficiency was often comparable to boys', their lack of confidence presented a significant barrier to their progress. This was similarly noted by girls themselves in the workshops in Cambodia and Indonesia.

Even where girls are interested in STEM subjects in school, this does not necessarily translate to the pursuit of STEM careers. For example, research with students in Viet Nam found that even though girls liked STEM subjects and perceived themselves as performing well at ICT, they did not tend to choose related fields for their studies or subsequent careers.[41] Research with girls in Singapore found that 37 per cent of those aged 17–19 years old reported they would not choose STEM professions, despite studying STEM subjects. Reasons provided by girls aged 12–19 years old included disinterest (68 per cent) and perceptions that STEM subjects were difficult (42 per cent).[42]

Similarly, when girls were asked their perceptions of STEM careers as part of the U-Report survey conducted in Viet Nam for this study, 30.6 per cent responded that these were not careers they wanted to pursue. This demonstrates a lack of interest and potentially also a lack of knowledge about these career options. It is perhaps worth noting that 25.2 per cent of survey participants reported they would like to pursue STEM careers but could not (some reasons for this are discussed later in this chapter under sociocultural factors).

Figure 3. Girls' perceptions of STEM careers (Viet Nam)
Source: UNICEF U-Report survey data collected for this study. (2023).



[40] Fraillon, J., Ainley, J., Schulz, W., Friedman, T. and Gebhardt, E., Preparing for Life in a Digital Age: The IEA International Computer and Information Literacy Study International Report, 2014; Organisation for Economic Co-operation and Development, The Role of Education and Skills in Bridging the Digital Gender Divide: Evidence from APEC Economies, 2019.
[41] UNESCO, STEM Education for Girls and Women: Breaking Barriers…, 2020.
[42] Mastercard, 'Inspiring Girls in STEM: Mastercard's Girls4Tech™ Program to Reach More than 13,000 Girls in Singapore by 2018', cited in UNESCO, STEM Education for Girls and Women: Breaking Barriers…, 2020.

CAREER ASPIRATIONS AND MOTIVATIONS

"I TALK TO MY PARENTS. I HAVE NOT YET THOUGHT ABOUT WHAT MY ACTUAL DREAM IS, BUT THEY ARE ALWAYS SUPPORTIVE."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 19, RURAL

"FROM GRADES 1-11, I WANTED TO BE A DOCTOR, BECAUSE YOU CAN EARN A LOT OF MONEY AND ALSO HELP PEOPLE. BUT THEN I CHANGED IN GRADE 12, BECAUSE I HAD SPENT 3 YEARS EXPLORING, AND I ENJOYED DOING CODING AND PROGRAMMING, SO I WANTED TO DO MORE."

GIRL WORKSHOP PARTICIPANT, CAMBODIA, 17, RURAL

During adolescence, girls (and boys) tend to go through a process of figuring out their aspirations and life options. This was visible during the workshops conducted with girls in Indonesia and Cambodia, where some girls expressed their lack of clarity around their career aspirations, while others had changed course over recent years, as they continued to figure out their options and interests. Key informants who supported girls through extracurricular STEM programmes similarly observed the malleability of girls' aspirations during this period.

"IF YOU STUDY TECHNOLOGY, MAYBE YOU CAN BECOME A TEACHER IN A VOCATIONAL SCHOOL"

GIRL WORKSHOP PARTICIPANT, INDONESIA, 18, RURAL

The aspirations that girls develop and the options that they choose between can often appear quite limited, largely aligning with gendered stereotypes of what is socially appropriate for girls and women, and having clear associations with caregiving, domestic and lower-skilled roles. For example, research conducted with young people aged 10–24 years old in Indonesia, Lao PDR and Thailand found that women were implicitly or explicitly limited to professions such as teachers, vendors, cooks, cleaners and tailors, and they could experience stigma if their professional aspirations were too 'ambitious'.[43] Similarly, key informants in Viet Nam who worked with girls in education observed that girls tend to focus on careers such as teaching, tailoring and hospitality. The same dynamic was visible in the workshops conducted with girls in Cambodia and Indonesia – across sessions a limited number of career aspirations were mentioned overall, and those most frequently mentioned often revolved around becoming a doctor or a teacher.

"MOSTLY MEN DO THESE JOBS. THEY HAVE TO BE KEEN TO RESEARCH, THEY HAVE TO LOVE STEM, LOVE TECH, AND THEY HAVE FINISH AN BA, MA, OR EVEN A PHD."

GIRL WORKSHOP PARTICIPANT, CAMBODIA, 17, RURAL

The limited range of career aspirations may partly be due to **perceptions that girls do not have the right to 'dream big' or that they do not know what pathways exist or might entail for other career options.** This was reported by key informants in Cambodia, Indonesia and Viet Nam, and has been noted in previous studies conducted in the region. For example, research conducted in Indonesia found a similar dynamic that pointed to a combination of 'aspiration gaps', where girls lacked understanding about the kinds of choices to make for the future, and 'information gaps', where they had limited access to credible information to guide choices about the future.[44] The issue may be magnified for STEM career options, as these types of careers are perceived primarily to be male domains, dominated by boys and men.

[43] UNDP and UNICEF, Addressing Gender Barriers to Entrepreneurship…2021.
[44] Nambiar, D., et al., Study on Skills for the Future in Indonesia, Oxford Policy Management, 2019.

"IF YOU STUDY TECHNOLOGY, MAYBE YOU CAN SELL PHONES OR REPAIR TECHNOLOGY."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 16, RURAL

"IF YOU STUDY MATHS, MAYBE YOU CAN BE A MATH TEACHER OR ENTREPRENEUR... THEY CAN ALSO WORK IN A BANK."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 16, RURAL

The lack of exposure to STEM or understanding of potential STEM career pathways was reflected particularly clearly by girls in the rural Indonesia workshop, as these girls had very limited knowledge or awareness of potential STEM career options.

"I'M NOW NOT IN SCHOOL BUT AM PLANNING TO CONTINUE SCHOOL AND HELP MY PARENTS. I WANT TO CONTINUE TO SENIOR HIGH SCHOOL. I WANT TO BECOME A DOCTOR. I WANT TO BUILD A HOSPITAL FOR MY COMMUNITY AND MY PARENTS. MY PARENTS SUPPORT ME TO BECOME A DOCTOR BUT WE HAVE NO FUNDING AVAILABLE."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 18, RURAL

"I WANT TO WORK IN THE NEXT 5 YEARS WITH A DECENT WAGE AND MAKE MY PARENTS HAPPY. I DON'T KNOW WHAT YET, BUT I JUST WANT TO HAVE BETTER PAYMENT."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 19, RURAL

Yet girls often have broader motivations when they are developing their career aspirations, which could be leveraged to frame STEM career options in a more appealing way. A study conducted with young people aged 10–24 years old in Indonesia, Lao PDR and Thailand found that adolescent girls and young women expressed a strong desire to serve their family and community through their career choices. This translated into professional aspirations such as nurse, teacher, police, doctor, farmer, or civil servant.[45] The study also found that girls from a young age cited their family's financial situation as a primary motivator behind their professional aspirations. In particular, young women living in poverty in Lao PDR and Indonesia expressed the need to contribute to improving their family's living standards.[46] Similar motivations were apparent during the workshops conducted with girls in Cambodia and Indonesia for this report, and might explain the high frequency of the aspiration to be a doctor.

Additionally, adolescent girls and young women across the ASEAN region often have strong entrepreneurial aspirations, particularly in Indonesia. A World Economic Forum survey in 2019 conducted among youth across the ASEAN region found 33.1 per cent aspired to work in an entrepreneurial setting.[47] Similarly, the aforementioned study that was conducted with 10-24 year-olds in Indonesia, Lao PDR and Thailand identified broad entrepreneurial intentions among girls and women across all age groups. Separately, research conducted in Indonesia with adolescents aged 10-18 years old found that the most common aspiration among participants was to become an entrepreneur, in various sectors including IT.[48]

STEM career pathways could potentially be linked to entrepreneurial endeavours and framed in line with girls' broader motivations such as caring for others, serving the community, and improving their family's financial situation. A move in this direction may already be happening for certain types of STEM careers, for example in the technology space. Key informants in Cambodia, Indonesia, and Viet Nam highlighted that technology-focused careers did appear to be growing in appeal for both girls and boys, partly because this was perceived to be a fast-growing sector with well-paid careers, and it had associations with familiar, 'cool' services and activities, such as social media and digital marketing.

[45] UNDP and UNICEF, Addressing Gender Barriers to Entrepreneurship…, 2021.
[46] Ibid.
[47] World Economic Forum (2019). ASEAN Youth Survey. < https://www.weforum.org/reports/asean-youth-technology-skills-and-the-future-of-work/ >
[48] Nambiar, D., et al., Study on Skills for the Future in Indonesia, Oxford Policy Management, 2019.

SOCIOCULTURAL FACTORS

Girls' aspirations, and their interest and engagement with STEM fields, are heavily influenced by sociocultural norms upheld by family, peers and the wider community.[49] These norms often reinforce stereotypical gender roles that limit the scope of girls' aspirations and reinforce that STEM is a male domain.

FEMALE GENDER ROLES AND STEREOTYPES

"EVERYONE SAYS WHY SHOULD A WOMAN STUDY IF SHE IS JUST GOING TO GET MARRIED ANYWAY."

GIRL WORKSHOP PARTICIPANT, CAMBODIA, 19, URBAN

"GIRLS EXPERIENCE DOMESTIC CHORES MORE IN COMPARISON TO BOYS - IF I AM A BOY, I MAY HAVE MORE TIME TO STUDY AND EXPLORE MY INTEREST."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 17, URBAN

Children across the region are often raised to believe that girls' and women's primary role is within the domestic sphere, which limits their opportunities and ability to seek opportunities outside of this domain. This was demonstrated in the aforementioned study with young people aged 10–24 years old in Indonesia, Lao PDR and Thailand, where girls reported being expected to balance their education and employment aspirations with an unequal share of domestic work.[50] Similarly, the research conducted with key informants and girls in Cambodia, Indonesia and Viet Nam for this report, found that girls were often expected to get married and focus on taking care of children and the home once they finish their education. Thus, **investing in more advanced education for girls can appear redundant, and in some instances, can decrease their marriageability, due to prevailing notions that highly educated girls might engage in careers that will take their time and attention away from the home.**

"PEOPLE SAY THERE'S NO NEED TO HAVE HIGH CAREER FOR WOMEN, ESPECIALLY THOSE THAT ARE TOO FAR AWAY."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 17, RURAL

"AS AN ONLY DAUGHTER, I HAVE DREAMS TO PURSUE STUDYING ABROAD, BUT MY PARENTS THINK I NEED TO BE MARRIED FIRST SO I CAN HAVE SOMEONE TO PROTECT ME. MY MOTHER IS OPEN BUT HAS LIMITATIONS AND EXPECTATIONS THAT GIRLS HAVE AN AGE-LIMIT TO PURSUE THEIR DREAMS. IF I WERE A BOY, I MAY HAVE MORE CAREER OPTIONS."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 15, URBAN

Concerns about girls' safety can also limit their opportunities to study or engage in careers that take them away from home, including to pursue advanced education in fields such as STEM. Key informants, and girls themselves, in the workshops in Cambodia and Indonesia observed that girls are often perceived to need protection, which their family is responsible for providing. This perceived need for protection can limit girls' mobility and constrain their career options to those that are local to their homes. Structural factors associated with geographic location and infrastucture combined with girls' mobility constraints can present significant barriers to their access to STEM education or employment opportunities.

[49] UNESCO, STEM Education for Girls and Women: Breaking Barriers…, 2020; UNDP and UNICEF, Addressing Gender Barriers to Entrepreneurship…, 2021.
[50] UNDP and UNICEF, Addressing Gender Barriers to Entrepreneurship…, 2021.

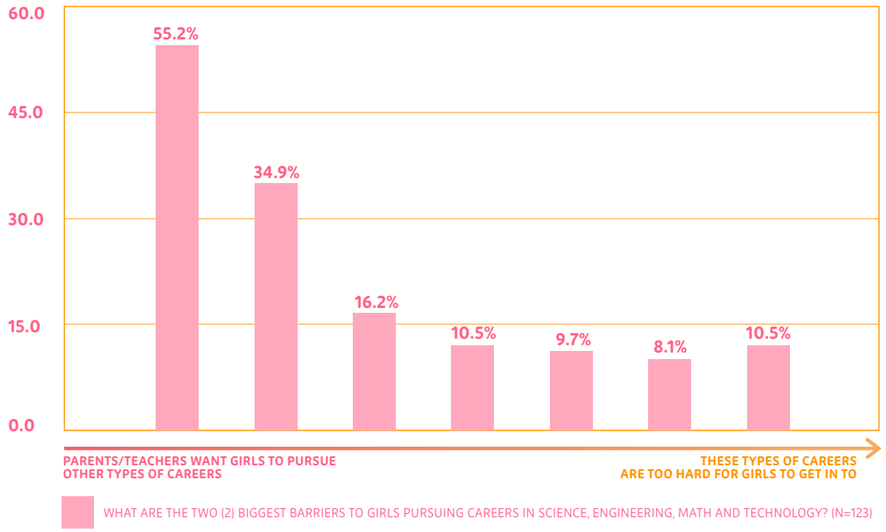
STEM AS A MALE DOMAIN

"STEM IS DOMINATED BY MEN, THEY ARE NERDS, SERIOUS, AND HAVE NO TIME TO PLAY."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 18, URBAN

Children are often raised to believe that STEM fields are inherently masculine, and thus boys and men are considered innately better at them than girls and women.[51] This is compounded by a lack of female STEM role models or portrayals of women in STEM roles in the media – STEM occupations are typically portrayed as male-dominated, and role models are often high profile male figures. Perceptions that STEM careers are male domains are only reinforced by the fact that these fields do tend to be dominated by boys and men – a vicious circle. Girls expressed these perceptions in the workshops in Cambodia and Indonesia, and in the U-Report survey conducted with girls in Viet Nam.

Figure 4. Girls' perceptions of their barriers to pursuing STEM careers (Viet Nam)
Source: UNICEF U-Report survey data collected for this study. (2023).



"WE HAVE MANY CLUBS IN SCHOOL, WHICH HELPS ME. BUT MANY GIRLS IN MY SCHOOL ARE STILL AFRAID TO EXPLORE STEM – THE CLUB IS STILL DOMINATED BY BOYS."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 15, URBAN

"TO BECOME A PHARMACIST, I NEED THE SUPPORT OF FAMILY, SOCIETY AND THE NEED TO HAVE ENOUGH PASSION."

GIRL U-REPORT SURVEY RESPONDENT, VIET NAM

These gender-related social stereotypes and attitudes can act as a barrier to girls' STEM aspirations in several ways. In instances where girls do want to pursue STEM careers, negative family or community perceptions can limit the social and/or financial support needed for girls to make progress. These negative perceptions can also be internalized by girls, leading them to believe that girls and women are not predisposed to be good at STEM subjects, and do not have the capacity to succeed in STEM fields. This can significantly dampen girls' interest, motivation and confidence to pursue STEM careers more generally.

The same gender norms can also limit girls' STEM career options, because employers may similarly subscribe to the view that men are better suited to STEM fields, and therefore prefer to hire men. This issue was highlighted by key informants in Cambodia and Indonesia who had found that when setting up STEM industry experiences for young people, some local businesses refused to accept girls in roles where they considered 'physical strength' a prerequisite (e.g. mechanic and engineering roles), even though the introduction of modern technology has made the need for physical strength redundant. This perspective may be more common among employers at a local, community level, as key informants from larger multi-national corporations had clear awareness of the gender gap in STEM and were actively working to address this (see Chapter 4 for more on this).

[51] UNESCO, STEM Education for Girls and Women: Breaking Barriers…, 2020.

Chapter 2:
Which stakeholders should be engaged to positively influence girls' career aspirations?

Girls' understanding and perceptions of STEM are heavily influenced by their exposure to these fields in their communities. The stakeholders who have the greatest influence over girls' career aspirations also tend to be those in their local communities, particularly parents/guardians and teachers. During the research conducted for this report, key informants and girls in Cambodia, Indonesia and Viet Nam described these stakeholders as highly influential and the primary source of information on career options for girls and boys.

"OUR PARENTS AND TEACHERS TELL US WHAT THEY THINK WE SHOULD DO AND ENCOURAGE OR DISCOURAGE US - IT IS HARD NOT TO LISTEN TO THEM, SO WE NEED TO HAVE THEIR SUPPORT TO PURSUE OUR DREAMS."

(GIRL WORKSHOP PARTICIPANT, CAMBODIA, 18, URBAN)

Peers, as well as figures in the media and on social media were identified as additional sources of information on careers, however they were perceived to play a less significant role than the adult figures in girls' day-to-day lives.

A fundamental challenge related to this group of most influential stakeholders, is that they do not tend to have the knowledge or motivation to inspire girls' STEM career aspirations. Key informants in Cambodia, Indonesia and Viet Nam emphasized that these stakeholders had limited knowledge of the career options available. In fact, they reported that there were minimal opportunities for girls (or boys) to receive informed career counselling or guidance overall.

At the same time, this also represents an opportunity to engage with these stakeholders towards positively influencing girls' career aspirations. This requires addressing harmful gender stereotypes as a whole, and more specifically in relation to STEM, through interventions that not only raise awareness of STEM career options, but that also convey the benefits of girls' participation in STEM fields in ways that resonate.

The following sections outline the roles and dynamics around each set of stakeholders, and the opportunities to engage them in positively influencing girls' career aspirations.

PARENTS AND GUARDIANS

Parents and guardians across the region, are highly influential in girls' and boys' education and career choices.[52] Key informants noted that this is partly because **familial support and harmony are considered strong cultural traits in communities across the region.** In Indonesia, for example, many young people, especially girls, feel they must please their parents and prioritize meeting family needs, before addressing their own needs or desires.[53] Mothers have an especially strong influence on girls' aspirations, potentially because of their ability to act as role models.[54] In Cambodia, key informants highlighted that mothers tend to play a greater role than fathers in career guidance for both girls and boys.

Parents/guardians are a primary source of information on possible career options for children. This was highlighted by girls in the workshops in Indonesia for example, who reported that they wanted their parents/guardians to provide a safe space where adolescents could discuss their career choices and ways to explore options. However, key informants in Cambodia, Indonesia and Viet Nam noted that **parents/guardians often have only limited awareness of potential career options, and particularly those related to STEM fields.** Instead, they tend to recommend jobs that women in their family or wider community have pursued previously. This suggests a narrow range of options for girls based on familiar, traditional career pathways, such as becoming a teacher or working in the service industry.

"I ALWAYS TALK TO MY PARENTS, MY PARENTS ARE THE ONES THAT SUGGESTED I BECOME A DOCTOR. IT GIVES ME MORE ENCOURAGEMENT TO BECOME A DOCTOR."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 18, RURAL

"IT TAKES DETERMINATION AND HARD WORK, JUST LIKE BOYS. BUT PERHAPS ABOVE ALL IT MUST BE THE SUPPORT FROM THE FAMILY."

GIRL U-REPORT SURVEY RESPONDENT, VIET NAM

Parents/guardians tend to be the key decision-makers involved in deciding whether girls (and boys) can pursue STEM fields. Most young people also rely on their parents/guardians for financial support to fund their education, including the advanced studies often required to pursue STEM careers. Without familial and financial support, girls and boys would find it daunting to pursue or progress in these types of careers.

"FOR ME, PARENTS, PEER SUPPORT, NEIGHBOURS ARE IMPORTANT SUPPORT FOR THIS TYPE OF INFO."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 16, RURAL

Furthermore, STEM career options are less likely to be recommended for girls, as many jobs within this space are relatively 'new' to parents/guardians. This means they are less likely to be familiar with what is involved, or to know people within the community, especially women, who are in these fields. Raising parents/guardians knowledge and awareness of STEM career options would be an important way to increase the likelihood of them recommending these pathways for their daughters.

"THE IDEA OF PARENTS IS THAT GIRLS SHOULD FOLLOW LEISURELY CAREERS SUCH AS TEACHING... LEAVE TIME TO TAKE CARE OF THE FAMILY, HOUSEWORK."

GIRL U-REPORT SURVEY RESPONDENT, VIET NAM

Parents/guardians themselves are influenced by wider social stereotypes and norms which can dictate the types of careers deemed suitable for girls. Key informants and girls reported that parents/guardians often wanted girls to engage in 'easier' career pathways, so that they are simultaneously able to focus on the family. Additionally, as boys and men tend to be perceived as better suited to STEM fields, parents/guardians were less likely to support or recommend these types of careers to girls. These underlying gender biases need to be addressed if parents/guardians are to effectively support and recommend STEM career options for their daughters.

[52] UNESCO, STEM Education for Girls and Women: Breaking Barriers…, 2020.
[53] Nambiar, D., et al., Study on Skills for the Future in Indonesia, Oxford Policy Management, 2019.
[54] UNDP and UNICEF, Addressing Gender Barriers to Entrepreneurship…, 2021.

Some other factors that parents/guardians consider when identifying potential career options for girls, could potentially be leveraged to make STEM careers more relevant and appealing. For example, key informants in Cambodia, Indonesia and Viet Nam observed that parents/guardians want girls to engage in jobs that are well-paid, so they can support the family financially. STEM fields are often financially lucrative, so this could be an important point to highlight. In addition, parents/guardians often want girls to train in sectors where there are plenty of jo b opportunities for women locally, so they can stay close to the home. Key informants highlighted that STEM sectors are growing, even in rural areas, meaning that local jobs are increasingly accessible. For example, key informants in Viet Nam mentioned that hydro-power, health and agricultural sectors are growing in rural areas, all of which have STEM components.

ENGAGING PARENTS/GUARDIANS IN SUPPORTING GIRLS' PARTICIPATION IN STEM FIELDS.

There are numerous challenges related to engaging parents/guardians in supporting girls' participation in STEM fields, particularly among low-income groups and those living in rural areas. Key informants in Cambodia, Indonesia and Viet Nam observed that these groups often have low traditional literacy and digital literacy, which means in-person activities and communication methods are often most effective. However, these groups typically also have very limited time available, particularly for subjects that they do not deem relevant or useful (e.g., STEM education), which can make in-person activities difficult to arrange.

At present, there appears to be a dearth of large-scale programmes in the region that focus on promoting parents/guardians' involvement in supporting girls' participation in STEM. Having said that, there are a few promising examples of innovative, CSO-led initiatives, which are seeing some progress in their approaches. These initiatives demonstrate the importance of addressing gender stereotypes around STEM; highlighting the breadth of STEM career options available and the benefits of engaging in these fields; while also promoting parent-child dialogue on the value of participation in STEM fields.[55]

Examples of innovative initiatives include:

Yayasan Cinta Anak Bangsa (YCAB), Indonesia[56]
YCAB aims to improve welfare through education and innovative financing. The organization found that when they ran workshops to educate parents/guardians in marginalized communities about the value of digital skills, the participation rate was very low. This was because target audiences were time-poor and needed to prioritize income-generation instead. However, YCAB also discovered that sharing information via a chatbot could be effective, as parents/guardians could access this in their own time, which tended to be at dawn or very late at night.

Generation Girl, Indonesia[57]
Generation Girl introduces girls and women to STEM from an early age through a range of innovative extracurricular programmes, which include holiday clubs and hackathons. The organization's philosophy with parents/guardians is 'show don't tell', as the best way to demonstrate the value of girls' participation in STEM. Generation Girl runs 'demo days' every week for the longer-term programmes, where families are invited to see what students have been working on. They have found this a highly effective means of educating and engaging parents in supporting girls' participation in STEM.

Sisters of Code, Cambodia[58]
Sisters of Code provides extracurricular training for female students aged 10–20 years old, through an 18-week programme in creative computing. The organization aims to engage parents/guardians by discussing with them – ahead of their children's participation – the benefits and opportunities available to girls from studying and working in the IT field. Sisters of Code also holds a graduation event for students and their families, which they have found highly effective in demonstrating to parents/guardians the value of girls' participation in STEM.

[55] UNESCO, Cracking the Code…, 2017.
[56] Key informant interview, Yayasan Cinta Anak Bangsa , Indonesia, 2023.
[57] Key informant interview, Generation Girl, Indonesia, 2023.
[58] Key informant interview, Sisters of Code, Cambodia, 2023.

TEACHERS

"I WANT TO BE AN ENGINEER – BECAUSE I LOVE MATHS AND MY TEACHER SAID 'IT'S OKAY YOU CAN DO IT, YOU DON'T HAVE WORRY THAT ENGINEERING IS ONLY FOR BOYS - YOU CAN DO IT TOO. I SUPPORT YOU AND AM ROOTING FOR YOU.'"

GIRL WORKSHOP PARTICIPANT, CAMBODIA, 16, RURAL

"MY TEACHER MOTIVATED ME TO TAKE A STATE TEST, THAT HELPED ME."

GIRL WORKSHOP PARTICIPANT, CAMBODIA, 18, URBAN

Across the region, teachers also have significant influence over girls education and career choices. **They are sometimes the principal source of professional guidance, especially in rural areas.**[59] This was demonstrated in a study conducted in the Philippines, which found that, while parents were the major decision-makers regarding their children's education tracks, children absorbed the greatest influence from their teachers.[60] These findings were supported by research for this report, where key informants and girls pointed to the sway teachers had over encouraging or discouraging careers in STEM fields. Girls in the workshops in Indonesia, expressed that they wanted teachers (as well as parents/guardians) to provide a safe space where adolescents could discuss their career choices and ways to explore options – this did not have to mean pursuing a STEM career necessarily, but rather enabling girls to feel supported by their teachers in preparing for their future more broadly.

"MY TEACHER IS MY ROLE MODEL, BECAUSE HE HAS EXPERIENCE IN ROBOTICS, AND HE SHARES HIS EXPERIENCE, SO I CAN LEARN A LOT FROM HIM."

GIRL WORKSHOP PARTICIPANT, CAMBODIA, 17, RURAL

"I CHOOSE AS A ROLE MODEL MY TEACHER, WHO CAN HELP ME TO STUDY."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 17, RURAL

Teachers can also act as role models for girls.[61] For example, when asked who their primary role models were for their career aspirations, several girls in the Cambodia and Indonesia workshops highlighted one of their teachers. Research has found that **female STEM teachers can have an especially positive influence on girls' engagement with STEM fields.**[62]

Case study: The influence of a female STEM teacher, Viet Nam

Ms. Quyen is a biology teacher who is working to close the gender gaps in STEM education and tackle gender bias in her community. Ms. Quyen has made significant contributions to STEM education over the past eight years through gender-sensitive practical demonstrations that engage girls in demystifying science and applying it in natural, everyday surrroundings. As founder of the project "STEM for Rural Areas", in 2018, Ms. Quyen supported more than 10 schools, benefiting more than 1,200 girls - particularly focusing on ethnic minority groups and children living with disabilities. As an ambassador for the British Council project, "Girls in STEM", her work at Le Hong Phong High School saw female students' participation in STEM activities increase from 45 per cent to 70 per cent. During the Covid-19 pandemic, she conducted 28 online webinars for teachers on STEM education, with new content on STEM and soft skills development for more than 84,000 teachers in Vietnam.

"TEACHERS ARE STILL DIGITALLY ILLITERATE, MANY ADOLESCENTS MISS OPPORTUNITIES BECAUSE TEACHERS ARE NOT SHARING IT."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 17, URBAN

Yet, many teachers in the region lack the requisite knowledge to engage girls in STEM fields, and lack digital literacy. Research conducted in Cambodia, Indonesia and Viet Nam showed low digital literacy levels among the teachers surveyed, and particularly among older age groups.[63] A case study from Viet Nam illustrated how teachers have limited opportunities to access STEM education and learn about innovative approaches to teaching; and students in remote areas were especially unlikely to have teachers qualified to teach STEM education.[64] This was similarly observed by key informants in Cambodia, Indonesia and Viet Nam, who reported that teachers often lack knowledge about the pedagogical approaches needed to effectively teach STEM education. Instead, they often use didactic and theoretical approaches, which are both unengaging and ineffective. The situation is exacerbated by a lack of equipment needed to make the lessons practical, particularly in rural areas.

[59] UNESCO, STEM Education for Girls and Women: Breaking Barriers…, 2020; UNDP and UNICEF, Addressing Gender Barriers to Entrepreneurship…, 2021.
[60] UNDP and UNICEF, Addressing Gender Barriers to Entrepreneurship…, 2021.
[61] UNDP and UNICEF, Addressing Gender Barriers to Entrepreneurship…, 2021.
[62] UNESCO, Cracking the Code…, 2017.
[63] UNICEF, Girls' Digital Literacy…2023
[64] UNICEF, Let Girls Shine: Empowering Girls Through Gender-responsive STEM Education, internal documentation, Vietnam, 2020.

"BOYS HAVE MORE PRIVILEGE IN STEM. MY FRIEND TOLD MY TEACHER THAT SHE WANTS TO TAKE ENGINEERING, BUT THE TEACHERS SAID THAT SHE WON'T SURVIVE ENGINEERING BECAUSE SHE WAS A GIRL. THE STEREOTYPES MAKE MEN AS MORE COMPETENT THAN GIRLS, EVEN IF GIRLS HAVE MORE SKILLS."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 18, URBAN

"GIRLS IN VIET NAM HAVEN'T HAD A CHANCE TO RECEIVE RELEVANT KNOWLEDGE IN SCHOOLS, AND FEW PARENTS OR TEACHERS SUPPORT LETTING THEM PARTICIPATE IN THESE OCCUPATIONS."

GIRL U-REPORT SURVEY RESPONDENT, VIET NAM

Teachers are also influenced by wider social norms, which shape their perceptions of girls' abilities and the types of careers deemed suitable for them. A study conducted in several ASEAN countries including Cambodia, Indonesia and Viet Nam, identified signs of implicit gender bias among teachers.[65] In particular, in response to an online survey conducted in Viet Nam, 26 per cent of teachers reported that they felt girls performed worse than boys in using digital devices (although the survey data cannot be considered representative). This finding was corroborated by separate research which identified significant bias among teachers, who believed that STEM careers were not suitable for girls.[66] Girls reported similar observations in the U-report survey in Viet Nam and the workshops conducted in Indonesia for this study.

Teaching approaches appear to be largely gender-blind. For example, data from the online teacher survey conducted as part of the UNICEF 2023 study on girls' digital literacy demonstrated that the majority of teachers in Cambodia and Viet Nam did not perceive any differences in how girls were taught compared with boys, nor did they feel that differences between girls and boys needed to be considered.[67] A separate study found teachers in Viet Nam have not paid much attention to gender equality issues – for example, there were no specific measures to involve girls in STEM-related activities.[68]

Underlying issues point to the importance of teaching approaches that consider the different learning needs and specificities of girls and boys. While formidable gains have been made in both primary and secondary education for girls – including towards improving gender parity in both secondary school enrolment and learning outcomes for adolescent girls – such parity is neither widespread nor does it reflect the fact that girls are not transitioning into skilled labour or entering male-dominated sectors, such as STEM. Globally, adolescent girls continue to face a gender digital divide, and are not learning the skills they need to transition to satisfying, well-paid work on an equal basis with boys.

ENGAGING TEACHERS IN SUPPORTING GIRLS' PARTICIPATION IN STEM FIELDS

Teachers need training on the role of gender stereotypes in STEM and the factors impacting girls' interest and motivation to participate in STEM fields. They also need access to professional development opportunities that can enhance gender-responsive STEM pedagogy.[69]

Based on the level of influence that teachers have, it would also be valuable to strengthen their capacity to provide career counselling for girls, in order to increase girls' awareness of possible STEM career pathways and the benefits of pursuing them.

There appear to be relatively few large-scale programmes in the region that are engaging teachers in supporting girls' participation in STEM fields. However, there are some promising initiatives employing approaches that could be effective. These include:

THE MINISTRY OF EDUCATION AND TRAINING, VIET NAM

With the assistance of UNICEF, the Global Partnership for Education, and other stakeholders, the MoET is developing various measures to ensure the education system addresses inequalities and champions gender inclusion.[70] These include: focusing teaching and learning materials for 3-6 year olds on "unstereotyping" so that teachers promote progressive and positive portrayals of girls, women, boys and men in the learning environment; and building gender-sensitive budgeting and a Digital Literacy Framework into the new Education Sector Plan, to close gaps in STEM learning outcomes for girls.

[65] UNICEF, Let Girls Shine: Empowering Girls Through Gender-responsive STEM Education…, 2020.
[66] UNESCO, STEM Education for Girls and Women: Breaking Barriers…, 2020,
[67] UNICEF, Girls' Digital Literacy…, 2023.
[68] UNESCO, STEM Education for Girls and Women: Breaking Barriers…, 2020.
[69] UNESCO, Cracking the Code…, 2017.

THE SCIENCE AND TECHNOLOGY PROJECT IN UPPER SECONDARY SCHOOLS, CAMBODIA

In 2022, the Asian Development Bank approved a $70 million loan, for the Cambodian Government to advance STEM education nationwide.[71] The project aims to increase the pedagogical skills and content knowledge of teachers, and strengthen STEM education delivery, by offering continuous professional development on effective and innovative teaching methods to 775 STEM teachers (at least 40 per cent women), and 25 STEM Masters degree lecturers from the National Institute of Education (at least 80 per cent women). Recognizing the role school leaders play in STEM education delivery and learning outcomes, the project will also provide continuous professional development to 155 upper secondary school directors (at least 80 per cent women). Ensuring that these gender quotas are achieved may be challenging from a project implementation perspective, due to the large number of men in these roles, however the intention is encouraging.

PEERS

Peers can influence girls' interest in STEM fields and their beliefs about appropriate career options for women.[72] **Peer acceptance is a central concern in adolescence, and same-sex friends can especially influence adolescent girls' engagement with STEM fields.**[73] For example, the influence of female peers has been found to be a significant predictor of girls' interest and confidence in mathematics and science.[74]

These findings are similarly reflected in the ASEAN region, where research conducted with young people aged 10–24 years old in Indonesia, Lao PDR and Thailand found that peers had a role to play in shaping girls' beliefs, aspirations and choices from an early age.[75] The key informants and girls involved in the research for this report also mentioned the influence of peers, although noting that it was significantly less than that of family members or teachers.

"WE CAN GAIN THE INFORMATION ON CAREERS FROM FORMAL OR INFORMAL CHANNEL, LIKE FROM OUR PEERS AND FROM SOCIAL MEDIA."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 16, RURAL

"SOURCES OF INFORMATION ON CAREERS ARE FROM TEACHERS WHO CAN TEACH ME, FRIENDS WHO CAN SUPPORT ME. ACCESS TO INFORMATION CAN BE OBTAINED THROUGH SOCIAL MEDIA (INSTAGRAM: BONETERKINI), ONLINE TOOLS, OR EVEN FRIENDS WHO STUDY ABOUT IT."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 17, RURAL

Peers appear to be slightly more influential in Indonesia, where girls mentioned them more frequently as a source of support and information on careers. Key informants involved in extracurricular STEM programming agreed that "youth listen to other youth", and that they had found it **effective to encourage young people's participation in STEM through social media campaigns and mobile/online groups (e.g., on WhatsApp and Facebook) that built a sense of community and information-sharing among youth.**

[70] UNICEF, Let Girls Shine: Empowering Girls Through Gender-responsive STEM Education…, 2020.
[71] Asian Development Bank, 'ADB to Strengthen Upper Secondary STEM Education Reforms in Cambodia', ADB, Manila, 7 November 2022.
[72] UNESCO, Cracking the Code…, 2017.
[73] Dasgupta, N. and Stout, J. G., 'Girls and Women in Science, Technology, Engineering, and Mathematics: STEMing the Tide and Broadening Participation in STEM Careers', in Policy Insights from the Behavioural and Brain Sciences, 1(1), 21-29, 2014.
[74] Ibid.
[75] UNDP and UNICEF, Addressing Gender Barriers to Entrepreneurship…2021.

FIGURES IN THE MEDIA AND ON SOCIAL MEDIA

"MY ROLE MODELS ARE MY PARENTS AND NAJWA SIHAB [A WELL-KNOWN REPORTER], ACTUALLY I WANTED TO BE NAJWA, EVEN THOUGH SHE IS NOT A DOCTOR, BUT I LOOKED UP TO HER."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 18, RURAL

"I SAW AN ARTICLE ABOUT A SUCCESSFUL TECH BUSINESS WOMAN - THAT MOTIVATED ME AS YOU DON'T SEE THAT A LOT."

GIRL WORKSHOP PARTICIPANT, CAMBODIA, 18, URBAN

Figures in the media can influence girls' perceptions of their career options and their interest in STEM fields. Girls in the workshops in Indonesia and Cambodia occasionally mentioned media figures as individuals they looked up to and respected. Media images of STEM professionals may be particularly significant for girls during adolescence, as this is a time when they are actively considering future career options.[76]

Figures on social media may potentially have even more influence on girls' knowledge, beliefs, aspirations and choices. Research conducted with young people aged 10–24 years old in Indonesia, Lao PDR and Thailand found that in Indonesia and Thailand particularly, **social media plays an increasingly important role in shaping girls' access to role models, information and opportunities.** Furthermore, girls aged 15-19 increasingly used social media for access to information and were heavily influenced by female social media influencers.[77]

"I WANT TO STUDY BUSINESS MANAGEMENT AT UNIVERSITY IN PHNOM PENH, TO BE A BUSINESS MANAGER. I WAS INSPIRED BY WHAT I SAW ON SOCIAL MEDIA – AN INFLUENCER WHO WAS A MILLIONAIRE FROM STUDYING/DOING BUSINESS."

GIRL WORKSHOP PARTICIPANT, CAMBODIA, 17, RURAL

"I WANT TO BECOME AN INFLUENCER."

GIRL U-REPORT SURVEY RESPONDENT, VIET NAM

The role of social media figured prominently among girls who participated in the research for this report. For example, several girls who participated in the Viet Nam U-Report survey listed becoming an 'influencer' among their career aspirations. Additionally, some girls in the workshops in Cambodia and Indonesia described developing their career aspirations after being inspired by what they saw on social media.

Leveraging positive role models on social media could be a valuable way to inform and inspire young people in the development of their career aspirations. Key informants in Cambodia, Indonesia and Viet Nam involved in STEM programming reported that they were increasingly working with social media influencers, and 'champions' from relevant sectors, to develop campaigns that aim to reach and inspire girls online, with role models and information from outside their immediate community.

[76] UNESCO, Cracking the Code…, 2017.
[77] UNDP and UNICEF, Addressing Gender Barriers to Entrepreneurship…2021.

Chapter 3:

What approaches can effectively support adolescent girls to transition to STEM careers?

When considering what can be done to effectively support girls, it is important firstly to establish what these approaches need to address.

As noted in chapter 1, adolescent girls are at a life-stage where they are still in the process of developing their sense of identity. Their career aspirations are often not fully formed, and in some cases, have not yet been given much thought. At the same time, at this age – typically secondary school level – they are often also expected to select subjects or study tracks. This necessarily impacts their choices about whether to continue studying certain subjects moving forward, including in STEM disciplines.

To compound this, among both girls and boys in this age group, there appears to be limited awareness of career options and pathways available, especially for STEM fields. Models and approaches to address this therefore, should not only increase their awareness about STEM fields, but also provide information on STEM career opportunities and career pathways.

"I FEEL FAMILIAR WITH STEM. MORE EXPOSURE AND PRACTICE MAKE ME FEEL CONFIDENT. WITH LEARNING MORE, I THINK I CAN WORK IN STEM. I THINK WE HAVE SKILLS RELEVANT TO THE OCCUPATION, HENCE IT MAKES US THINK WE CAN WORK ON THAT FIELD."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 17, URBAN

Girls especially lack knowledge and interest in STEM fields, and the confidence or motivation to pursue them beyond education. Therefore, approaches that can support girls to develop a 'STEM identity' or sense of belonging within the STEM space will be important. These should be combined with strategies that promote interest and perceived relevance, to make STEM more appealing to girls.

Three steps to support adolescent girls' transition to STEM careers:

1. **Ensure STEM education addresses the needs of girls and prepares them for STEM careers:** Ensure that STEM education within the public education system is driving interest in these fields and supporting girls' sense of belonging and confidence within the STEM space.
2. **Raise awareness of STEM career options:** Make girls aware of the STEM career options and pathways available.
3. **Frame STEM fields in ways that are appealing to girls:** Ensure the benefits of engaging in STEM careers are highlighted, alongside their 'fit' with girls' needs and those of their families.

It is important to note that this chapter focuses specifically on girls, and on approaches that directly target and address them, rather than on approaches that target the key stakeholders in their lives (see Chapter 2 on the latter).

ENSURING STEM EDUCATION ADDRESSES THE NEEDS OF GIRLS AND PREPARES THEM FOR STEM CAREERS

STEM education needs to be practical, fun, relevant and responsive to the needs of girls if it is to effectively engage and inspire them to participate in STEM, and aspire to STEM careers.[78] Key informants involved in extracurricular STEM programming in Cambodia, Indonesia and Viet Nam highlighted a number of techniques they have found successful in creating this type of learning environment.

Effective approaches include:

- **Project-based learning:** Students engage in interactive and practical projects. This encourages them to use their own initiative to complete assignments, which can build their self-confidence. It also supports students to develop a range of soft skills that are integral to STEM, including critical thinking and problem-solving.[79]
- **Addressing real-world problems:** Students are often encouraged to choose a real-world problem to address in their project. Emphasizing real-life applications for STEM can help girls to see the relevance and importance STEM can have in their own lives and communities.[80]
- **STEM integration:** STEM is taught using interdisciplinary approaches that draw from each subject discipline (e.g, maths, science, technology), rather than tackling each subject in isolation.
- **Collaborative and peer learning:** Students often work in pairs, small groups or teams to develop their projects. These strategies are beneficial for all learners, however they have been found to be particularly effective at engaging girls with STEM.[81]
- **Safe and supportive learning environments:** Some programmes are only open to girls, which can ensure they feel comfortable expressing themselves during the learning process. Even when programmes include girls and boys, emphasis is put on ensuring the environment is non-competitive, fun, and avoids gender stereotyping, to encourage girls' participation.
- **Gender-responsive resources:** Curricula and training materials are designed to avoid the promotion of gender stereotypes and perpetuating the image that STEM careers are not for girls and young women. For example, when referring to STEM fields, imagery and language refers to girls and women in parallel to boys and men.

Teachers that are trained in gender-responsive STEM pedagogies are key to offering this type of education. Gender differences in STEM education participation at the expense of girls are already visible in early childhood care and education, so it is **important to effectively integrate gender-responsive STEM education throughout the school system,** ideally from the initial stages of early childhood education (ECE) onwards.[82]

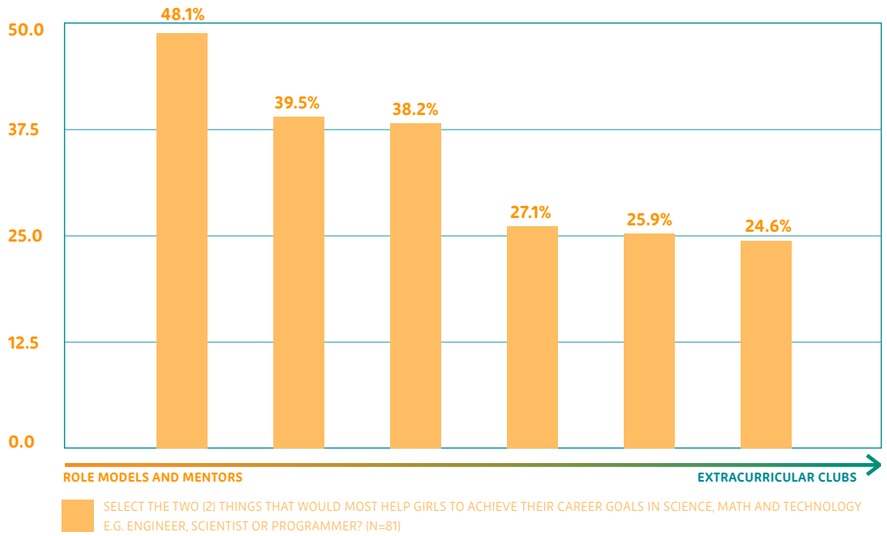
Additionally, multiple studies point to the benefits of offering STEM learning opportunities outside school settings, especially for girls.[83]This can stimulate interest in STEM by ensuring students are exposed to STEM in a range of real-world environments, allowing them to experience the field without concerns about their academic 'performance'. Key informants highlighted a number of ways to do this including: after-school clubs, holiday camps, community-based projects, field trips, innovation competitions, industry visits and internships. In order to offer these opportunities to students within the public education system, it is vital for education institutions to develop partnerships with extracurricular programme providers and STEM industry employers, who can provide access to these types of experiences.

[78] UNESCO, Cracking the Code…, 2017.
[79] UNESCO, I'd Blush If I Could…, 2019.
[80] Ibid.
[81] Ibid.
[82] UNESCO, Cracking the Code…, 2017.
[83] Ibid.

RAISING AWARENESS OF STEM CAREER OPTIONS AND MAKING THEM APPEALING TO GIRLS

Various support models and approaches were explored with girls in Cambodia, Indonesia and Viet Nam as part of the research for this report. In all three countries, girls highlighted 'role models and mentors', 'industry experience' and 'scholarships and financial support' as the models they felt were most valuable to inspire and support girls' progression along STEM pathways.

Figure 5. Girls' perceptions of most valuable support models and approaches (Viet Nam)
Source: UNICEF U-Report survey data collected for this study (2023).



ROLE MODELS AND MENTORS

"HAVING FEMALE MENTORS IN STEM MAKES ME WANT TO PURSUE A STEM CAREER."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 15, URBAN

"ROLE MODELS/MENTORS ARE MOST IMPORTANT BECAUSE THEY HAVE ADVANCED EXPERIENCE TO TEACH AND GUIDE ON HOW TO GET THE JOB AND ALSO TO INSPIRE."

GIRL WORKSHOP PARTICIPANT, CAMBODIA, 17, RURAL

Role models and mentors can play an important role in addressing gender stereotypes around STEM fields, providing inspiration, and highlighting STEM career pathways for girls and women. For example, a study conducted by UNESCO in the region found female role models were reported as a positive influence on girls' interest and confidence in STEM across six of their case study countries.[84] Research conducted with young people aged 10–24 years old in Indonesia, Lao PDR and Thailand also found that **girls' perceptions of what was attainable and desirable for women were shaped by female figures that were visible in their family, community, and in the media.** The same study found that across the age range, girls and women called for visible and accessible female role models.[85] Key informants and girls in Cambodia, Indonesia and Viet Nam similarly highlighted the importance of female role models and mentors during the research for this report.

[84] UNESCO, STEM Education for Girls and Women: Breaking Barriers…, 2020.
[85] UNDP and UNICEF, Addressing Gender Barriers to Entrepreneurship…, 2021.

"I WANT ROLE MODELS WHO ARE IN MY COMMUNITY AND SIMILAR TO MY AGE - BECAUSE THE GIRLS BELOW ME HAVE ME AS A ROLE MODEL - THEY SEE ME INVOLVED IN TECH AND THEY THINK 'OH SHE'S JUST LIKE ME, SO I CAN DO THAT TOO'. THAT'S IMPORTANT."

GIRL WORKSHOP PARTICIPANT, CAMBODIA, 17, RURAL

"AS FOR MENTORS, I FOUND THAT THE AGE GAP MATTERS. IT IS MORE COMFORTABLE TO TALK TO SOMEONE NEAR MY AGE."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 17, URBAN

"FEMALE MENTORS FROM MARKODING ARE ALSO MY ROLE MODELS, ESPECIALLY LEARNING FROM THEIR LIFE AND THEIR UPDATES FROM SOCIAL MEDIA."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 15, URBAN)

While different types of role models and mentors can be inspirational for girls, community role models and mentors are especially desirable. These are women from within girls' own communities, who are typically close to them in age and in the early stages of their career or further along in their education. Key informants and girls involved in the research for this report highlighted that girls find it particularly easy to identify with these women, and thus aspire to follow a similar path. These women are also considered more approachable, and thus align with opportunities for mentorship. In some instances, girls felt safer exploring their career options with these types of figures, as it can be challenging to discuss this with parents/guardians or teachers, particularly in relation to non-traditional career pathways (such as STEM). Key informants involved in extracurricular STEM programmes observed that programme alumni from the community were often the ideal role models and mentors for girls participating in their programmes.

"I WANT A VERY SUCCESSFUL ROLE MODEL IN MY COUNTRY AND IN ANOTHER COUNTRY. I WANT TO HEAR ABOUT HER NEW IDEAS AND NEW OPINIONS. BECAUSE THEN MAYBE I CAN LEARN FROM THEM."

GIRL WORKSHOP PARTICIPANT, CAMBODIA, 17, RURAL

'Aspirational' role models are also appealing, although to a lesser extent. These are women from outside girls' communities who are further along in their career and have been highly successful. They were considered valuable by key informants and girls in the research conducted for this report, partly because there tend to be few female STEM role models available from within girls' own communities. These women also show how far girls could go in STEM careers, over time.

The role model format can vary widely, depending on the context and resources available. Key informants gave examples of role model talks, dinners, workshops, video seminars, and posts on social media. STEM industry employers highlighted that female role modelling can even simply involve ensuring that when students attend a study tour of industry spaces, the host should be a female member of staff (e.g., a software engineer).

Role model and mentor roles can overlap, but where possible, mentoring should cover multiple objectives. Mentors can help girls learn STEM-related skills, and offer guidance on how to improve self-confidence, self-esteem and motivation, how to deal with bias, and how to overcome anxiety about assessments. They can also help girls learn about their career options, for example by providing information about relevant resources and networking opportunities.[86] Additionally, they can provide guidance about financial resources, such as scholarships and free or reduced-cost programmes. Key informants involved in extracurricular programming emphasized the important role their mentors played in addressing these various issues with girls.

In the absence of role models or mentors, key informants and girls pointed to the value of case studies, stories and articles on women who have been successful in STEM fields. These can come in a range of formats (e.g., video testimonials), however, ideally, case studies should be as localized as possible, to help girls better identify with them.

[86] UNESCO, Cracking the Code…, 2017.

INDUSTRY EXPERIENCE

"INDUSTRY EXPERIENCE - TOURS, AND INTERNSHIPS ARE MOST IMPORTANT, BECAUSE IN CAMBODIA THERE ARE NOT MANY OPPORTUNITIES TO ENGAGE WITH INDUSTRY. A LOT OF GIRLS IN CAMBODIA HAVE A DREAM, LIKE BEING AN ENGINEER, BUT THEY DON'T KNOW WHAT EXACTLY ENGINEERS DO, OR THE WORK, SO IF WE CAN GIVE THEM OPTIONS TO INTERN, THEY CAN LEARN. THEY CAN LEARN MORE ABOUT HOW IT WORKS IN REAL LIFE"

GIRL WORKSHOP PARTICIPANT, CAMBODIA, 17, RURAL

Industry experience can be particularly valuable for driving interest in STEM among girls, and inspiring them to pursue STEM careers. Industry experience can take many forms, including study tours, short-term work experience, internships, and collaborative projects between education institutions and industry organizations. Yet, key informants and girls emphasized that there were **very few opportunities for girls to gain industry experience.**

"MOST IMPORTANT IS AN INDUSTRY STUDY TOUR AND INTERNSHIPS – I HAD THIS EXPERIENCE IN THE TECHNOVATION PROGRAMME. I HAD THE OPPORTUNITY TO SEE HOW PROGRAMMING AND CODING REALLY WORKS, I DID A STUDY TOUR AT A SMALL TECH COMPANY - THIS INSPIRED ME TO CREATE A SMALL APP MYSELF."

GIRL WORKSHOP PARTICIPANT, CAMBODIA, 17, RURAL

When designing industry experiences, it is important to ensure that they are relevant to both girls and the industry organizations involved. **For younger age groups (e.g., in secondary education), the role of industry needs to focus on providing inspiration and exposure, through, for example, study tours or career talks and activities in the office.** Key informants from industry expressed that at this age, students generally did not have the skills needed to engage in work experience, since these are often developed later on during tertiary education. Younger students are also often still figuring out what career paths they are most interested in, so they need inspiration rather than the skills development that work experience can offer.

For older students (e.g., in tertiary education), the role of industry experience should focus on supporting skills development. Key informants from industry noted that by this stage, students generally know what career pathways they are interested in, and have developed the basic skillset needed to engage in industry work experience. Here, STEM employers can support students to further develop the skillsets needed by STEM industries, to supplement what formal education institutions often struggle to do (due to outdated curricula, lack of equipment and teaching resources, etc. as described in Chapter 1).

Industry experience may have a **more practical application for students in vocational education, particularly related to STEM sectors where less advanced skill sets are required.** In Indonesia, for example, some key informants involved in extracurricular STEM programming highlighted that they support young people to get industry experience in local businesses that, while not high-tech, nonetheless offered important STEM services, for example working as a mechanic.

Finally, it is important to ensure that industry experiences are designed with STEM employers that girls find appealing and who have a local presence. Key informants mentioned that STEM employers who are well-known and considered 'cool' are particularly appealing to girls (e.g., Gojek or Google in Indonesia). Partnering with STEM employers who have a presence in the local area, can help ensure that girls can aspire to local job opportunities. For example, in rural parts of Indonesia where mining is a prominent industry, these are ideal STEM industry partners.

SCHOLARSHIPS AND FINANCIAL SUPPORT

Family financial constraints are often a key barrier to girls pursuing higher education or skills-building opportunities. Research has found that across Southeast Asia, those from low-income groups, particularly girls and women, are often restricted in their access to learning opportunities due to financial limitations and must seek alternative avenues to advance their education.[87]

Scholarships are a valuable way to support girls (and boys) to overcome financial barriers and progress with STEM education.[88] This was noted by girls in the research conducted for this report, who described it as an important way to help them fund higher education.

[87] UNDP and UNICEF, Addressing Gender Barriers to Entrepreneurship…, 2021.
[88] UNESCO, I'd Blush If I Could…, 2019.

There are already some scholarships available, provided by a range of different stakeholders. In Cambodia, for example, the MoEYS began providing annual tuition fee scholarships for young people to attend university from 2002 onwards, and there are currently up to 7,000 scholarships available annually to support students enrolled in public and private universities.[89] These types of opportunities could be expanded further, and be administered by partnerships between government, higher education institutions, the private sector, and other actors.[90]

"I'VE NEVER HEARD ANYTHING ABOUT SCHOLARSHIPS."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 17, RURAL

"THERE'S A SCHOLARSHIP BUT YOU NEED SPECIFIC REQUIREMENTS ON YOUR GPA, AND I AM NOT CONFIDENT ENOUGH TO APPLY."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 19, RURAL

"I WANT TO FIND A UNIVERSITY WHERE I CAN GET A FULLY FUNDED SCHOLARSHIP."

GIRL WORKSHOP PARTICIPANT, CAMBODIA, 16, RURAL

Even if scholarships exist, however, there may be information gaps about how to access them, as well as possible confidence issues around applying for them. This was evident in the workshops conducted with girls in Cambodia and Indonesia, where participants said that they did not know how or where to apply for this type of financing, or were not confident they met the requirements.

Some extracurricular STEM programme providers aim to support girls in addressing these issues. For example, key informants involved in extracurricular STEM programming described how they address financial constraints by providing their programmes free of charge or offering scholarships to participate. In some instances, they also lend equipment, such as digital devices, to students who lack digital access. Further, as part of ongoing student support following completion of their programme, these providers often assist students with scholarship applications for tertiary education.

Another approach, that may be relevant for vocational STEM education, involves supporting students to 'earn while they learn'. The MoEYS in Cambodia is exploring this approach via programmes they are developing in collaboration with the World Bank, to promote an interest in STEM while simultaneously helping low-income students fund their higher education. The secondary schools involved focus on either agriculture, electrical engineering, food processing, or animal raising, and work in partnership with local tertiary institutions to produce relevant products and services for the local market. This type of approach may also be more accessible for students in older age groups who are eligible for paid internships.

EXTRACURRICULAR CLUBS

"I ONCE WAS INFLUENCED BY THE STEREOTYPES ABOUT STEM. BUT SINCE I GOT AN OPPORTUNITY TO ATTEND STEM BOOTCAMP PROGRAMME, I HAVE CHANGED PERCEPTION ABOUT STEM. NOW I SEE STEM AS AN IMPORTANT FIELD BECAUSE WE CAN HELP AND CHANGE WORLD SITUATION."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 15, URBAN

"THE MOST IMPORTANT IS EXTRACURRICULAR CLUBS BECAUSE EVERYTHING COMES THROUGH THE CLUBS, SO YOU CAN SHAPE YOUR KNOWLEDGE AND EXPERIENCE AND LEARNING - YOU CAN NETWORK WITH PEOPLE AND MEET MENTORS, ROLE MODELS ETC. AND YOU CAN JOIN THE COMPETITIONS (LIKE TECHNOVATION)."

GIRL WORKSHOP PARTICIPANT, CAMBODIA, 17, RURAL

Extracurricular clubs can be valuable for increasing girls' exposure to STEM experiences in a non-academic environment. Key informants in Cambodia, Indonesia and Viet Nam highlighted the role these types of clubs play in building girls' sense of belonging in STEM spaces and encouraging their interest and confidence in engaging with STEM fields. ***Extracurricular STEM clubs complement formal education as they often have a more advanced curriculum that is responsive to industry needs, along with the resources and equipment needed or practical, hands-on learning.*** They tend to use a range of pedagogical techniques to ensure STEM learning is fun, relevant and gender-responsive.

[89] Bunry, R. and Walker, K. (2022). 'Cambodian Women and Girls: Challenges to and Opportunities for Their Participation in Higher Education', in McNamara, V. and Hayden, M. (Eds.), Education in Cambodia: From Year Zero Towards International Standards, Springer Nature, Singapore, 2022.
[90] UNESCO, Cracking the Code…, 2017.

Some extracurricular clubs specifically target girls' participation in STEM, such as Generation Girl and Girls in Tech in Indonesia, and Sisters of Code in Cambodia. These clubs work to address the particular learning needs of girls, including by ensuring the learning environment feels safe, supportive and collaborative, by introducing female role models and mentors, and addressing parental concerns around their daughters' participation.

Extracurricular STEM clubs are often unable to serve adolescents from the most disadvantaged backgrounds. Key informants highlighted that in Cambodia, Indonesia and Viet Nam, these types of clubs are typically located in urban areas, as they need a stable infrastructure to operate successfully. They also tend to serve communities with families from slightly higher socio-economic backgrounds, where children and adolescents are more likely to be in full-time education, be familiar with English and/or the national language(s), and already have digital access. **The value of such clubs to target the specific learning needs of particular population groups presents many opportunities to improve and broaden girls' access to STEM learning, particularly if their capacities and resources could be harnessed to reach underserved communities.**

PEER SUPPORT NETWORKS

STEM peer support networks and communities can help girls and women develop a sense of belonging within STEM spaces, facilitate role modelling, mentorship, opportunities for technical and soft skills development, and knowledge exchange and collaboration.[91]

These networks and communities may be particularly valuable for girls at the older end of the age range, who are entering tertiary education and the early stages of their career. At this life-stage, STEM spaces become increasingly male-dominated, so it is important that girls and women can find the support of female peers.

Case study: 'Women in Tek Network', Cambodia

The Asia Foundation has established the 'Women in Tek Network' in Cambodia, which aims to bring together and support female industry professionals in STEM through networking, mentorship and business coaching. The network may potentially be leveraged in the future to support and inspire girls and women at earlier stages of their STEM career, for example through online campaigns, podcasts, and talks at universities. To-date, 30 women have joined the network.

"I REALLY LOVE THE TECH COMPETITIONS, BUT BOYS GENERALLY ONLY WANT TO BE IN A TEAM WITH OTHER BOYS. SO, IF YOU'RE A GIRL, IT CAN BE HARD TO FIND A TEAM TO COMPETE WITH. BUT I HAVE A GOOD TEAM NOW – I TEAMED UP RECENTLY WITH SOME OF THE SAME GIRLS I WAS WITH IN MY FIRST TEAM, WHEN I DID THE TECHNOVATION PROGRAMME."

GIRL WORKSHOP PARTICIPANT, CAMBODIA, 17, RURAL

"I STILL HAVEN'T FOUND A PROPER PEER SUPPORT WITH SAME VISION, PERHAPS I CAN GET FROM VOCATIONAL SCHOOL."

GIRL WORKSHOP PARTICIPANT, INDONESIA, 15, URBAN

Peer support networks and communities can also be valuable for younger age groups. This was highlighted by key informants and girls involved in extracurricular programming, particularly in Cambodia and Indonesia, where community support is considered especially important. **These programmes tend to make a concerted effort to develop a sense of community among participants, encouraging girls to work together and support each other to achieve their goals.** They also encourage participants to become 'alumni' on completion of the programme, so that the STEM community grows and extends beyond the initial programme. This can be a valuable source of support for girls as they progress further along STEM career pathways into more male-dominated spaces.

[91] Dasgupta, N. and Stout, J. G., 'Girls and Women in Science, Technology, Engineering, and Mathematics: STEMing the Tide and Broadening Participation in STEM Careers', in Policy Insights from the Behavioural and Brain Sciences, 1(1), 21-29, 2014; Boccuzzi, E., and Uniacke, P., Accelerating Women's Advancement in STEM: Emerging Lessons on Network Strategies and Approaches in Asia, The Asia Foundation, 2021.

Case study: Generation Girl, Indonesia

Generation Girl, an extracurricular STEM programme provider for girls and women in Indonesia, was established with the explicit aim of creating a STEM community for girls and women. This was driven by the co-founders' own experience of being in a small minority of female professionals in the STEM employment space. Generation Girl engages in a range of community-building activities, some of which have minimal links to STEM (e.g., mug-painting, playing with Lego), to help create strong bonds and support networks that can out-last anticipation in the programme.

Case study: Technovation, Cambodia

Technovation is a global tech education nonprofit that has chapters in 100+ countries, including Cambodia. The Technovation Girls programme aims to equip young women (ages 8-18) to become tech entrepreneurs and leaders. Supported by a network of mentors, ambassadors, volunteers and parents, girls work in teams to code mobile apps that address real-world problems. Girls in participating countries follow a 12-week programme, which culminates in a global competition. Technovation ambassadors emphasize that this enables girls to learn from each other through co-operation in their local teams, and also by connecting and competing with girls across the world.

CAREER COUNSELLING SERVICES

Girls often have a limited range of sources where they can get informed career guidance. Key informants in Cambodia, Indonesia and Viet Nam observed that there was a lack of career counselling services available for young people in these countries and called for greater career orientation, particularly in the school environment.

There appears to be an increasing focus on developing these types of services for young people. In Viet Nam, for example, the MoES is developing gender-responsive career counselling to encourage girls' interest in STEM jobs.[92] Similarly in Cambodia, the MoEYS aims to establish a service network of career counsellors, although currently they only operate in 'New Generation Schools', which are very limited in number (approximately 11 in total) and are more advanced than other schools in the wider public school system.

When designing these services, it would be valuable to create resources that provide information on educational institutions offering STEM programmes, scholarship opportunities, and frequently asked questions about careers in STEM.[94] These resources should be combined with access to advisors who are familiar with STEM fields, and who can inspire girls to choose STEM careers. Here, it is also important to frame STEM fields in ways that are palatable to girls and their families – including highlighting job opportunities that are local, high-income career paths, and linking STEM fields to entrepreneurship.

Case study: Trey Visay (e-counselling app), Cambodia

To tackle the gap in career counselling services, KAPE, a local CSO in Cambodia, has been collaborating with the MoEYS to develop an e-counselling app called Trey Visay ('Compass').[93] The app aims to provide high school students with information on different career options and help them identify career pathways that suit their needs and interests. Via the app, students can learn which career options best suit their personality, what different types of careers involve, and their opportunities and benefits.

[92] United Nations Children's Fund and the International Telecommunication Union, Towards an Equal Future: Reimagining Girls' Education Through STEM, UNICEF and ITU, New York, 2020.
[93] Kampuchea Action to Promote Education (KAPE), Current Project: Trey Visay App. <https://www.kapekh.org/en/>
[94] UNESCO, Cracking the Code…, 2017.

Chapter 4:

How can different actors support girls to pursue STEM fields?

Around the region, a broad tapestry of actors are engaging in activities to support young people's participation in STEM fields, and in some cases, especially targeting girls' involvement. Governments, education institutions, CSOs and industry actors are employing a range of approaches, including role models and mentors, industry experiences, extracurricular clubs and holiday camps, scholarship opportunities, online training courses, competitions, fairs and festivals, among others.

Despite this, a more systematic and holistic overall framework to support girls' participation appears to be lacking. Many actors use models and approaches that fit their specific objectives, resources and local context, and engage independently with different partners and programmes. The overarching framework is fragmented as a result, with actors often operating in siloes. Key informants in Cambodia, Indonesia and Viet Nam raised concerns about this, expressing that it could lead to a duplication of effort, gaps in STEM education provision and support, and a less effective and efficient approach overall.

Siloes need to be addressed at the national, regional and global level. Key informants noted that with the onset of Industry 4.0, it is increasingly important for countries to produce a 'global workforce' who have advanced STEM skillsets and the ability to engage in 'continuous learning', where workers continue to update their skillsets over the course of their career. To produce such a workforce, countries must collaborate with each other to stay abreast of the most recent STEM trends and industry needs both regionally and internationally.

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This calls for a larger, more comprehensive framework – **an 'ecosystem' approach, where actors work to complement, collaborate and learn from each other's activities in order to avoid working in siloes, and to foster coherence and efficacy.** This will require one actor to play the role of 'convener' for other actors in the STEM space; and the roles of other actors to be well clarified and communicated. Importantly, the convener must be able to bring together governments, education institutions, CSOs, industry employers and any other relevant actors, to work in coordination through holistic strategies to support young people, especially girls, to engage and participate successfully in STEM fields. The following sections indicate what these roles might involve for different actors based on their needs, capacities, resources and interests.

GOVERNMENT

Governments across the ASEAN region have broad visions for the future that emphasize the importance of STEM for human and economic development. For example, the Vietnamese Government is working towards industrialized nation status, and to achieve this, has prioritized investing in science and technology. An integral element of the Government's policy focus has therefore been on STEM education and developing a highly skilled workforce that can participate in the global economy.[95]

"I THINK WE NEED MORE ACCESS TO INFORMATION ON THESE CAREERS... MAYBE THE MINISTRY OF EDUCATION CAN PROVIDE THIS"

GIRL WORKSHOP PARTICIPANT, INDONESIA, 18, RURAL

Governments are vital to create enabling environments for girls' participation in STEM, through actions that incentivize girls and encourage their families, communities and wider society to support their participation. Actions can involve launching national campaigns that address negative gender stereotypes, promote positive images of women in STEM, and increase awareness of STEM educational opportunities and careers among the wider population.[96] This role was recommended by girls themselves in the Cambodia and Indonesia workshops.

Governments can also lead the way for other actors to support girls' participation in STEM fields, by introducing policy measures that engage the entire age-range from early education through to employment. These measures can include legislation, quotas and financial incentives, and other actions that specifically target education institutions, STEM industry employers and girls themselves.

Perhaps most importantly, governments are responsible for ensuring education systems support girls' participation in STEM fields. Education systems have an imperative to address gender stereotypes and bias, to inspire girls to pursue STEM fields, and to teach them the skills and mindsets needed to participate in STEM. However, education systems in many countries in the region are often unable to play this role, as they are struggling with curricula, pedagogical and infrastructure challenges, and operate in predominantly gender-blind ways.

Governments therefore need to transform public education to actively support and encourage girls' participation in STEM fields. This requires commitment, such as that demonstrated by the Declaration on The Digital Transformation of Education Systems in ASEAN, for digital technology.[97] It also requires dedicated budgeting and policy support. Ministries that are responsible for finance must provide budgetary support for actions and measures needed to transform public education systems. This involves budget allocations for ministries that are responsible for STEM education, and also for ministries that are responsible for complementary activities related to STEM, such as deploying digital infrastructure. Education policies must also be developed to address the integration of gender-responsive STEM education. For example, Education Strategic Plans (ESPs) need to be cognizant of gender stereotypes and biases in relation to STEM, and must address them appropriately. The significant interplay between budget and policy must also be considered, as demonstrated for example in Cambodia, where the MoEYS has developed a Gender Mainstreaming Strategic Plan, but implementation continues to be a challenge, in part due to issues with funding.

[95] Chen, Danying et al., 'STEM Education and STEM-Focused Career Development in Vietnam', in H. T. Tran et al. (eds.), Human Resource Development in Vietnam, 2021.
[96] UNESCO, Cracking the Code…, 2017.
[97] ASEAN, Declaration on The Digital Transformation of Education Systems in ASEAN, 2022. <https://asean.org/declaration-on-the-digital-transformation-of-education-systems-in-asean/>

Actions to transform education systems include:[98]

- **Investing in infrastructure:** Build the necessary infrastructure to ensure schools across locations can offer practical STEM education. This includes providing adequate power supply (electricity) and internet connectivity.
- **Investing in STEM facilities and equipment:** Provide adequate access to STEM facilities and equipment, such as science and computer labs, and digital devices, to ensure schools can offer practical STEM education.
- **Integrating STEM education across life-stages:** Integrate STEM education throughout the school system, ideally from the initial stages of early childhood education (ECE) onwards. In countries such as Cambodia, this may require a review of the current curricula, to assess how to incorporate STEM education.
- **Building teachers' capacities:** Provide access to professional development for teachers across all locations, that enhances gender-responsive STEM pedagogy and addresses factors impacting girls' interest in participating in STEM fields.
- **Strengthening STEM curricula.** Develop strong conceptual frameworks, and content that is contextualized and relevant to real-world situations. Also, ensure that content addresses the needs of groups that are at risk of social exclusion (e.g., ethnic minorities, rural, low-income, people with disabilities), and is available in local languages that are familiar to students and teachers.
- **Improving learning materials and resources.** Create resources suited to the learning styles of girls and remove gender bias and stereotypes from textbooks and other learning materials. Ensure resources address the needs of groups that are at risk of social exclusion (e.g., ethnic minorities, rural, low-income, people with disabilities), and are available in local languages that are familiar to students.
- **Developing real-world learning opportunities:** Provide practical learning opportunities outside the academic environment, for girls to discover real-world STEM applications.
- **Linking to role model and mentorship opportunities:** Demonstrate that STEM career pathways are a viable and valuable option for girls by providing access to role models and mentors operating within the STEM space.
- **Facilitating access to gender-responsive career counselling.** Provide information and advice on educational institutions offering STEM programs, scholarship opportunities, STEM employment opportunities and frequently asked questions about careers in STEM for girls.
- **Engaging parents and guardians in STEM outreach programs.** Address misconceptions about sex-based innate abilities and gender stereotypes about girls' and women's roles and capabilities; expand understanding of STEM educational opportunities and careers; connect families to career counselling services to provide advice on STEM pathways.
- **Incentivizing STEM education enrolment.** Offer scholarships for girls and women who choose to specialize in STEM fields at advanced levels, and for those who choose to engage in non-academic training programmes.

Transforming education systems in this way requires support from other actors including STEM industry employers and CSOs. Key informants highlighted that governments needed to collaborate closely with STEM industry employers to identify the specific competencies needed for various job roles, and to develop educational experiences that mimic what students might encounter in the workplace. Additionally, support from employers and CSOs would be essential to help develop and implement tailored training programmes for both teachers and students.

[98] UNESCO, Cracking the Code…, 2017.

While the Governments of Cambodia, Indonesia and Viet Nam are taking significant steps to transform their education systems and collaborate with partners to ensure STEM education is relevant and up-to-date, there are important challenges to address in each country. Key informants pointed to the fact that many actors continue to operate in silos, and coordination between various actors and programmes is limited. **Part of the problem lies in the fact that STEM education can fall under the purview of multiple ministries.** In Cambodia for example, the Ministry of Industry, Science, Technology and Innovation and the Ministry of Post and Telecoms play key roles related to STEM alongside the Ministries responsible for education. Furthermore, some key informants observed that **although industry actors are often invited to discuss education policy in government forums, industry needs were not yet effectively or systematically being integrated within education policy.**

CIVIL SOCIETY ORGANIZATIONS

Civil society organizations (CSOs) play an important role in offering extracurricular STEM learning opportunities that can help address gender stereotypes and bias, inspire girls to pursue STEM careers and support them to develop the skills and mindsets needed to participate within STEM fields. **They can be essential partners for governments to create an enabling environment for girls, not only by incentivizing girls to participate in STEM, but also to encourage their families and the wider community to support their participation.**

CSOs have a unique ability to focus on gaps in formal education and address these through highly targeted interventions. There are several examples of CSOs in the region that offer STEM learning opportunities for girls who have limited access to STEM education or resources. These organizations develop interventions that target the specific learning needs of these girls (see Extracurricular Clubs, and Peer Networks above).

CSOs can also respond rapidly to changes in the local environment (e.g., during the COVID-19 pandemic) or to industry needs, ensuring curricula is up-to-date and highly relevant to both students and industry. Key informants noted that this was because CSOs are able to rapidly test and iterate new curricula and pedagogical approaches, exploring what is most effective and engaging for the groups they support.

The following are collaborative actions CSOs and governments can take to foster an enabling environment, and scale up STEM interventions to expand outreach and benefit to girls:

- **Supporting parents, families and communities to understand the value of girls' participation in STEM.**
  - **Engaging parents in STEM outreach programmes:** Address misconceptions about sex-based, innate abilities and gender stereotypes about girls' and women's roles and capabilities; expand understanding of STEM educational opportunities and careers.
  - **Promoting parent-child dialogue:** Share materials designed to increase communication between parents and their adolescent children about the value of STEM fields; invite parents/guardians to events where they can see and experience results of their children's participation in STEM.
- **Supporting education institutions to strengthen STEM learning opportunities for girls.**
  - **Strengthening the capacity of teachers to encourage girls to pursue careers in STEM:** Offer training programs that highlight factors impacting girls' participation in STEM and pursuit of STEM careers; upskill teachers in gender-responsive STEM pedagogy.
  - **Strengthening STEM curricula and instructional materials to better promote girls' participation in STEM:** Share curricula and materials that are effective and engaging for girls; share resources suited to the learning styles of girls.

Promoting positive images and stories of women in STEM.

- Identify opportunities to spotlight and celebrate the contributions of women in STEM – such as media campaigns that showcase stories of women who have challenged restrictive gender norms in STEM careers; community events that celebrate women in STEM; and interviews with women STEM leaders.

Incentivizing STEM education enrolment for girls.

- Offer scholarships for girls who choose to specialize in STEM fields at advanced levels, and those who choose to engage in non-academic training programmes.

STEM INDUSTRY ACTORS

Industry actors have a valuable part to play in inspiring girls' pursuit of STEM careers, and in collaborating with government and education institutions to ensure industry needs are addressed within curricula.

STEM industry leaders are keenly aware of the 'skills gap' between what young people are taught in school versus the STEM skills needed in the global workforce. For example, key informants in Indonesia consistently highlighted statistics from the World Bank that suggested that between 2015 and 2030, there will be a shortage of 9 million skilled and semi-skilled ICT workers in Indonesia.[99] They observed that to address this shortfall, there needs to be an addition of 600,000 new STEM graduates per year, and yet the existing education system only has the capacity to produce 100,000–200,000 a year.[100] Furthermore, key informants emphasized that these graduates often lack the skills vital to STEM employment, such as the ability to problem-solve, think critically, manage projects or engage in 'continuous learning' over the course of their career.

STEM industry leaders are highly motivated to address this skills gap and are willing to explore a range of strategies on how best to do this. Such strategies include collaboration with government, education institutions and CSOs to upskill and inspire young people – for example offering industry visits, role model and mentor opportunities, school talks, internships and capstone projects. The opportunities here tend to focus on inspiring younger age groups (e.g., during secondary education) and offering skills development for older age groups (e.g., during tertiary education). Adolescents are slightly below the age-range STEM employers have the capability to engage in their own programmes, but they are keen to support the activities of education institutions and CSOs engaged with this age-range to promote career aspirations and pathways to STEM fields.

Some industry leaders are also developing their own training programmes to address the skills gap, often through their corporate social responsibiity (CSR) initiatives. For example, Indosat Ooredo Hutchison, a major telecommunications provider in Indonesia, has launched 'ID Camp' (Indosat Ooredoo Hutchison Digital Camp), an online scholarship program which aims to produce Indonesian developers/ programmers who are ready to compete in the digital economy.[101] The programme has already reached over 180,000 people and there are plans to expand it to include high school students. The GoTo Group, which combines the two most valuable start-up companies in Indonesia, has a non-profit arm called Yayasan Anak Bangsa Bisa that has launched 'Generasi GIGIH', a training programme to produce 'critical, persistent, tough and highly competitive technological talent, that are able to face future challenges'.

[99] The World Bank, 'Preparing ICT Skills for Digital Economy: Indonesia within the ASEAN context', Jakarta, 8 March 2018.
[100] Lia Sadia, 'The Case of Digital Talents Gap in Indonesia', 2 December 2022, medium.com. Lia Sadia is the pseudonym for Aulia Halimatussadiah who is the founder of Remote Skills Academy in Bali, Indonesia. <https://salsabeela.medium.com/the-case-of-digital-talents-gap-in-indonesia-e55e12e8d1d5>
[101] Indosat Ooredoo Hutchison, Free Coding Scholarship & Offline Training: IDCamp x KADIN. <https://idcamp.ioh.co.id/>

STEM industry leaders are increasingly recognizing the gender gap that exists in STEM fields and taking steps to address it , both within their own organisations and wider society. Key informants from leading STEM industry employers across the region noted the emphasis their organizations put on equality and diversity internally. While many had not achieved gender parity yet, they were consciously working towards it, and had put in various measures to better support female staff. Such measures include peer support networks, meet-ups and mentorship opportunities. These organizations are also focused on achieving gender parity in their STEM training programmes and are investigating ways to increase female participation, for example, by introducing female role models and mentors, and targeting confidence issues.

STEM industry employers also showed a willingness to partner with educational institutions and CSOs that support adolescent girls in STEM. Still, some key informants noted that while this means that they are open to initiatives that support girls specifically, when offering their own internships and work experience opportunities however, they considered it important to open these to both girls and boys to promote equality and inclusivity.

Case Study: SAP & ASEAN Foundation, ASEAN region

SAP (a global technology business) and the ASEAN Foundation launched a regional data analytics competition in 2017 called 'ASEAN Data Science Explorers' (ASEAN DSE).[102] Targeting tertiary students across all 10 ASEAN member states from any discipline, the programme aimed to enhance young people's digital literacy and 21st century skills across the region. In 2017, only 15 per cent of participants were women. By 2022, however, this number had risen to 54 per cent. This was achieved by providing role model opportunities – for example by encouraging girls to take the stage at events – supporting female alumni to act as mentors; and encouraging mixed gender competition teams.

UNICEF

UNICEF may be well-placed to play the role of convener within a more comprehensive, holistic ecosystem framework, due to its position as a multilateral organization that has a broad focus on young people and equity, and since it already has relationships in place with a range of STEM actors across the region. UNICEF is also uniquely placed to ensure inclusivity and support the most vulnerable, due to its guiding principle as a United Nations agency to 'leave no one behind'.[103]

To play the role of convener, UNICEF needs to have a clear view of the roles and activities of different actors at the national, regional, and global level. This is vital to understanding where there are gaps in support within local STEM pathways for young people, and particularly for girls. It is also key to identifying where STEM actors may be operating in siloes or duplicating efforts, and could instead complement, collaborate and learn from each other.

UNICEF must also understand the capacities, interests and needs of individual STEM actors. This is because a key part of the role of convener would involve facilitating relationships between different types of actors. Some relationship-building activities may therefore be necessary for UNICEF country and regional offices. In Viet Nam, for example, key informants noted that UNICEF is well-respected and has strong relationships with the MoET, but there is an opportunity to develop broader and deeper relationships with STEM actors in the private sector. Additionally, relationship-building and collaboration with the wider range of ministries involved in STEM-related activities (such as infrastructure development) in each country will also be necessary, to ensure a multisectoral approach.

[102] ASEAN Foundation, ASEAN Data Science Explorers, <https://www.aseanfoundation.org/asean_data_science_explorers >
[103] For more information, see: United Nations Sustainable Development Group, 'Leave No One Behind', <https://unsdg.un.org/2030-agenda/universal-values/leave-no-one-behind>

CONCLUSION: OPPORTUNITIES FOR ACTION

Based on the findings from this study, five opportunity areas are outlined below. These offer potential entry-points to effectively support adolescent girls in the ASEAN region to transition into STEM careers.

OPPORTUNITY 1: Develop a holistic 'ecosystem' approach, where actors work to complement, collaborate and learn from each other's activities.

This approach is valuable to break down siloes at national, regional and global level; identify and address duplication of effort and gaps in STEM education provision and support; and ensure greater effectiveness overall. The following actions are important:

- **Establish one actor to play the role of 'convener':** This actor must be able to bring together governments, education institutions, CSOs, industry employers and any other relevant actors, to work holistically on supporting young people, and particularly girls, to participate in STEM fields.
    - UNICEF may be well suited to play the role of convener, due to its position as a multilateral organisation that has a broad focus on young people and equity, and already has relationships in place with a range of STEM actors across the region. Alternatively, UNICEF could help to set up the role of convenor, or establish a taskforce who can take ownership of this role.
- **Clarify the roles of individual actors:** This will differ for each actor depending on their resources and interests. However, the findings from this research suggest that:
    - Governments are well suited to 'lead the way' – creating an enabling environment through policies and incentives relevant to other actors and improving the delivery of STEM education in public schools.
    - STEM industry employers are well suited to inspire younger age groups (through partnerships with education providers); support skills-development among older age groups (either through partnerships with education providers or via their own programmes); and advise education providers on industry needs.
    - CSOs are well-suited to plug the gaps in STEM education provision for specific population groups (e.g., girls, rural, low-income), through extracurricular programming that meets the specific learning needs of these groups.

OPPORTUNITY 2: Develop social and behavioural change strategies to engage key stakeholders, especially parents/guardians and teachers, in supporting girls' STEM career aspirations.

To garner this support, it is important to address gender stereotypes, including in relation to STEM, raise awareness of STEM career options and make girls' participation in STEM appealing, by highlighting opportunities and benefits in a way that resonates with stakeholders. This can be encouraged through the following actions:

- **Engage parents/guardians in STEM outreach programs:** Address misconceptions about sex-based, innate abilities; expand understanding of STEM educational opportunities and careers; connect families to career counselling services to provide advice on STEM pathways.
- **Promote parent-child dialogue on STEM:** Share materials designed to increase communication between parents and their adolescent children about the value of STEM fields; invite parents/guardians to events where they can see the results of their children's participation in STEM.
- **Frame STEM fields in ways that appeal to girls' families and communities:** Highlight local job opportunities and high-income career paths; links to entrepreneurship may also make STEM fields more appealing for girls, especially in Indonesia.
- **Strengthen the capacity of teachers to encourage girls' participation in STEM:** Offer training programs that highlight factors impacting girls' participation in STEM; upskill teachers in gender-responsive STEM pedagogy and career counselling.

OPPORTUNITY 3: Support efforts to improve STEM education within public education systems and through extracurricular programming.

To effectively engage and inspire girls to participate in STEM, and to prepare young people with the skills and mindsets they will need in the workforce, STEM education needs to be practical, fun, relevant and gender-responsive. Key actions to support this include:

- **Invest in infrastructure:** Build the necessary infrastructure to ensure schools across locations can offer practical STEM education. This includes the infrastructure to provide adequate power supply (electricity) and internet connectivity.
- **Invest in STEM facilities and equipment:** Provide adequate access to STEM facilities and equipment, such as science and computer labs, and digital devices, to ensure schools can offer practical STEM education.
- **Strengthen STEM curricula:** Develop strong conceptual frameworks, and content that is contextualized and relevant to real-world situations, especially for girls. Also, ensure that content addresses the needs of groups that are at risk of social exclusion (e.g., ethnic minorities, rural, low-income, people living with disabilities), and is available in local languages that are familiar to students and teachers.
- **Remove gender stereotypes from learning materials:** Create resources suited to the learning styles of girls and remove gender bias from textbooks and other learning materials. Also, ensure resources address the needs of groups that are at risk of social exclusion (e.g., ethnic minorities, rural, low-income, people living with disabilities), and are available in local languages that are familiar to students.
- **Develop real-world learning opportunities:** Provide practical learning opportunities outside the academic environment, for girls, and boys to experience real-world STEM application.
- **Build teachers' capacities:** Provide access to professional development that enhances gender-responsive STEM pedagogy, for example through student-centred and project-based learning opportunities, peer and collaborative learning opportunities, and cultivation of safe and supportive learning environments for young people, and especially girls.

Particular attention needs to be paid to supporting young people in rural areas, low-income households, and those with limited electricity or internet access, to gain access to high-quality STEM education opportunities.

OPPORTUNITY 4: Leverage models and approaches that effectively raise girls' awareness of STEM career options and help to make STEM pathways appealing to them.

There are a variety of models and approaches that can be effective, however, 'role models and mentors', 'industry experience' and 'scholarships and financial support' are particularly valuable to inspiring and supporting girls' progression along STEM pathways. When designing these models and approaches, the following considerations are important:

- **Role models and mentors:** 'Community' role models and mentors are especially desirable. These are women from within girls' own communities, who are close to them in age and in the early stages of their career or further along in their education. 'Aspirational' role models can also be appealing. These are women from outside girls' communities who are further along in their career and have been highly successful in their fields.
- **Industry experience:** Industry experience can take many forms, including study tours, short-term work experience, internships, and collaborative projects between education institutions and industry organisations. However, for younger age groups (e.g., in secondary education), the role of industry needs to focus on providing inspiration and exposure, for example by offering study tours or career talks and activities in the office, as students at this age often do not have the skillsets needed to engage in STEM work experience and internships.
- **Scholarships and financial support:** Though highly valued, there are information gaps around how to access existing scholarship options, and some girls have confidence issues around applying for them. The options need to be clearly mapped out, the application process must be clear and simple, and girls may need support and encouragement from key stakeholders (e.g., teachers).

OPPORTUNITY 5: Build an evidence base to cover the wider ASEAN region, address data gaps around demographic sub-groups, and to explore the effectiveness of new models and approaches.

This report took a case-study approach, which means it cannot be considered representative of the wider ASEAN region, or of the demographic sub-groups within the three 'focus' countries included in this study. Additional research areas of value include:

- **Exploring approaches that can effectively support demographic sub-groups:** including young people, and specifically girls, from rural areas; low-income households; ethnic minority backgrounds; and those living with disabilities.
- **Testing and co-creating new models with girls, key stakeholders and the various actors involved in delivery and implementation:** This can help to ensure any new models and approaches developed are fit-for-purpose and meet the needs and interests of each group.
- **Deep-diving into understanding labour market needs:** This can help to better orient curricula and materials to the needs of industry, and reduce the skills gap between education and employment.

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Appendix I:
Survey script (Viet Nam only)

WELCOME MESSAGE

Hi U-Reporter! UNICEF wants to hear how you feel about a future career in science, engineering, math or technology (so for example a career such as a Engineer, Scientist or Web Programmer). Your responses will make sure girls' voices are heard and help inform UNICEF's research into what can help adolescent girls to reach their career goals.

Leaving so soon? We look forward to hearing from you in the future. If you change your mind you can always come back by replying with the word Career.

1. In one word or sentence, please tell us what your career ambitions are?

2. When you think about careers in science, technology, engineering and math (e.g. Engineer, Scientist, Programmer) **what is your perception of them?**

A. These are careers I would like to do but can't
B. These are careers I would like and can achieve
C. These are careers I don't want to do
D. I don't know about these careers

I did not understand that. Please respond A, B C or D.

3. Please select the two (2) biggest barriers to girls pursuing careers in science, engineering, math and technology?

A. Girls don't know enough about these types of careers
B. Parents/teachers want girls to pursue other types of careers
C. These careers are more for boys than girls
D. Girls are not interested in these types of careers
E. These types of careers are too hard to get in to
F. Cannot afford to pursue these types of careers
G. Other - please outline

4. What do girls need to help them pursue these types of careers?

5. Select the two (2) things that would most help girls to achieve their career goals in science, math and technology e.g. engineer, scientist or programmer?

A. Role models and mentors: People who are already in these careers, who share their learnings with girls
B. More resources and better teaching of these subjects at school
C. Peer support networks (online or offline):Online and offline events and clubs where you can meet other girls pursuing these careers
D. Internships and work experience at relevant organizations (e.g. tech companies)
E. Extracurricular clubs: Where girls can learn more about these careers out of school, through fun activities and events
F. Scholarships: Financial support to study the relevant subjects at university and on other academic courses

You can select more than one option by separating each letter with a space (example: A B)

I'm sorry, we can only process the available options A, B, C, D, E, F. You can write several options by separating them with a space.

6. Is there anything else you feel we should know about girls' participation in these types of careers in Viet Nam?

CLOSING MESSAGE

Thank you for your participation! Your voice will help us inform UNICEF's submission, which will be included in the discussions and negotiations leading up to the Future Summit, where the final version of the Global Digital Compact will be presented. Click here for more information on the Global Digital Compact https://www.un.org/techenvoy/global-digital-compact

If you would like to receive notifications about new information available and participate in topics of interest to young people, you can register as a U-Reporter by sending JOIN.


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