

Frontier digital technology: Transforming noncommunicable disease prevention among youth



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Introduction

Early adolescence is a pivotal moment when negative influences can cause long-term habits and adverse consequences, even if health effects manifest later in life. Researchers estimate 70% of premature deaths in adults can be linked to behaviors that start in adolescence.¹ As noncommunicable diseases (NCDs) account for 71% of deaths globally,² the World Health Organization specifically calls out the need to reduce modifiable risk factors and underlying social determinants through the creation of health-promoting environments³ in order to reach Sustainable Development Goal 3.4. In Vietnam, NCDs are responsible for approximately 80% of all deaths and 75% of disability-adjusted life years⁴ and are increasingly prevalent among youths (10 to 24 years old). The popularity of risky behaviors among youth such as unhealthy diets, lack of physical exercise, smoking, and alcohol abuse is leading to the growing burden of NCDs in adulthood and contributed to 20%, 11%, 20%, and 8% of deaths in Vietnam, respectively.⁴ A recent study found that 26% of secondary students in Vietnam were overweight or obese,⁵ and another survey found about 15% of students grades 8–10 have started smoking.⁶ The key to NCD prevention is education and behavior change, in line with the World Health Organization's "best buys" interventions for NCDs (i.e., cost-effective and feasible for implementation),⁷ during adolescent years to have a lasting impact on the health and wellness of future adult populations.

In January 2019, the Vietnam Prime Minister approved a national project for the Ministry of Education and Training (MOET) to deploy an NCD prevention program within the education system.⁸ Considering its limitation of expertise and resources, MOET discussed with PATH, a global health nonprofit organization, a

vision to develop an educational program about NCDs through a pilot project, then integrate it into the national education system to benefit millions of youths. Beginning in November 2021, with funding from Fondation Botnar, PATH and MOET have implemented the project "Fit for the Future: Leveraging Data and Frontier Technologies to Build an NCD Program for Youth, with Youth" to address NCD risk behaviors among adolescents in Vietnam (Figure 1). Within the three-year life, this project not only serves to meet the growing needs of youth and their teachers, but also does so in an environment where there is increasing recognition that digital information and communication technologies can support health systems to cope with the growing disease burden. The Government of Vietnam has recently begun embracing digital innovations and is committed to adopting digital technologies across industries, including health care, as promoted by the Prime Minister.

Education model and digital application

To address unhealthy behaviors among adolescents, the Fit for the Future project is developing the Educational Program on NCD Prevention. The program will include:

- i) A mobile- and web-based application with artificial intelligence to provide students, parents, teachers, and school administrators with tailored knowledge, skills, and support to practice NCD prevention. Twenty e-lessons in the application will cover mental health disorders, associated risk behaviors for NCDs, and guidance on changing these risk behaviors. Additionally, the application will allow for Q&A with artificial intelligence-generated prompts, track risk behaviors of the users, and produce an NCD-related behavior report, along with notifications, tips, and indicators to encourage users. Users—mostly youth—will be able to access the app individually and learn about topics that interest them.
- ii) A subject on NCD prevention to be incorporated into an offline school curriculum. The school teachers equipped with a teaching manual, developed by the project, will deliver 11 lessons to provide their students with basic knowledge on NCDs, associated risk behaviors, and guidance on changing these risk behaviors, as well as sources of support.

Abbreviations: AI, Artificial Intelligence; BMI, Body Mass Index; FAQ, Frequently Asked Questions; MOET, Ministry of Education and Training; NCD, Noncommunicable Disease; Q&A, Question and Answer

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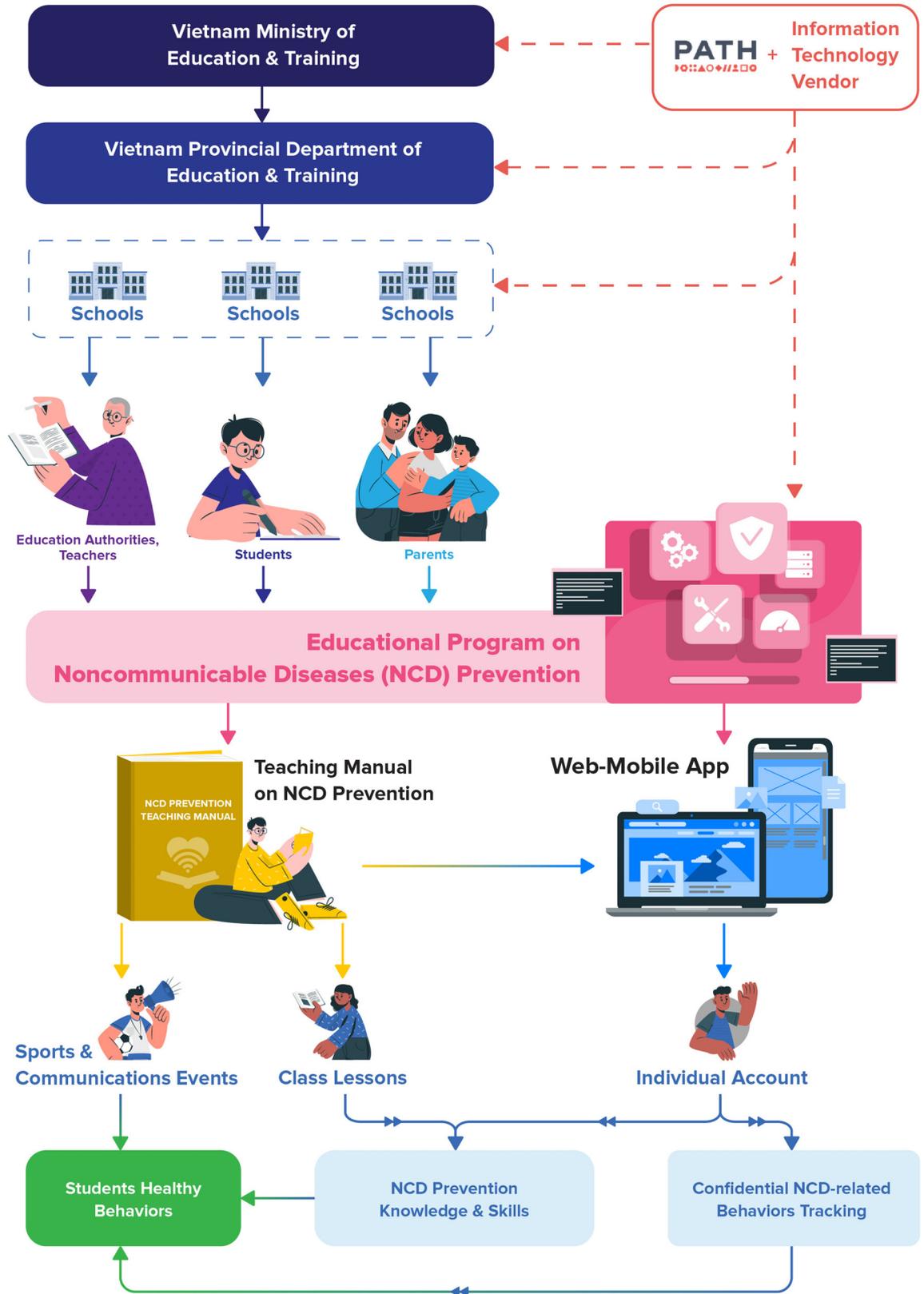


Figure 1. Program design for "Fit for the Future".

Under the educational program, and in collaboration with MOET, the application and curriculum will be combined as a blended intervention: schoolteachers will deliver 11 lessons from the program's teaching manual, while students will self-study relevant content from the mobile/web application prior to each class. During the classroom lesson, students will discuss a topic of NCD prevention and practice new skills under their teacher's facilitation. Along with the curriculum, the project will support schools in organizing regular communication and sporting events to promote NCD prevention. The events will involve not only students and teachers but also parents, community leaders, and local health authorities. The project expects the participation of these relevant stakeholders will create an enabling environment for youth to practice healthy behaviors.

From 2021 to 2023, the project will be piloted in 15 secondary and high schools in 3 provinces with more than 10,000 students ages 12 to 18 years. A baseline survey (June 2021) and a final evaluation (May 2023) will be conducted to measure the knowledge, attitudes, and practices of students on NCD prevention before and after implementing the educational program—as well as collect responses from parents, teachers, and education authorities about NCDs and the demand for NCD prevention education for young people.

The application's development, which began in December 2021 by Online Training Management, is expected to be completed by September 2022—at the beginning of the school year in Vietnam. Young people are also taking an important role in the development process. As youths are digital natives and some of the earliest adopters of new digital applications, the project will explore their technology behaviors to identify what resonates with them most and what features they would like to have in an application. The developers are consulting with youth throughout all components for each version of the application. After the testing phase is complete—which includes hundreds of students, teachers, and education authorities—the final version of the application will be handed to MOET to operate. Under the project's educational program, more than 10,000 adolescent students, along with 20,000 parents and family members, are expected to practice healthy behaviors of NCD prevention introduced through the application. The data generated from the program will indicate gaps in youth knowledge on NCDs and can be used to guide MOET on education policies and programs.

In order for the educational content and policies to resonate with youth, the project will further engage students, peer networks, and social media influencers in the design and advocacy of healthy behaviors to advance health equity goals and increase collective action. The final evaluation of the project in 2023 will review not only the educational program's results but also evidence of the application's effectiveness in promoting behavior change among youth. Based on that evidence, MOET

will decide to integrate the application into their website to create a “digital educational ecosystem” that connects target audiences with relevant stakeholders and supports decision-makers in health education and school health programs for youth. Further, as Vietnam undergoes rapid technology advances, innovations such as e-health and artificial intelligence will be leveraged to address young people's health and well-being beyond the life of the project (Figure 2).

Public health innovation

Digital technology is an integral part of daily life, particularly among youth, to access social media channels, games and entertainment, news outlets, and lifestyle apps, among others. Utilizing the digital platform for health education and NCD prevention is key for the Fit for the Future project and offers several advantages, such as the delivery of the intervention irrespective of space and time constraints, potential cost-effectiveness, special appeal to youth, and scalability.⁹ These advantages are significant in the context of Vietnam as they contribute to improving equitable access to health information, in this case for students with diverse socio-economic backgrounds.

Furthermore, internet- and mobile-based interventions have the potential to contribute to long-term behavioral changes because they can adapt to the needs of the individual or group, based on collected data and multiple assessments, and offer tailored solutions (made possible by artificial intelligence), especially when combined with behavioral change techniques and learning principles to help users gain knowledge and practice skills. To our knowledge, there have been very few research studies or initiatives with a specific focus on NCD-related risk factors among Vietnamese youth, resulting in limited data and understanding of their NCD-related behaviors. Hence, the ability to gather data and tailor solutions through internet- and mobile-based programs is a cost-effective and immediate way to offer evidence-based interventions.

The Fit for the Future project is the first-ever comprehensive NCD-prevention intervention applying frontier digital technologies with a school-based program in Vietnam. It will demonstrate how frontier technologies such as artificial intelligence and social media platforms can expand existing evidence-based tools to impact NCD-related risk behaviors in young people. This project takes a unique approach that brings together youth participation, human-centered design, artificial intelligence, and social media platforms to deliver an NCD prevention program that is both sustainable and scalable to benefit Vietnam's youth and beyond.

The e-learning program will provide education about the causes, symptoms, and long-term effects of NCDs, while the mobile/web app will integrate an animation component for youth to visually see the effects of risk

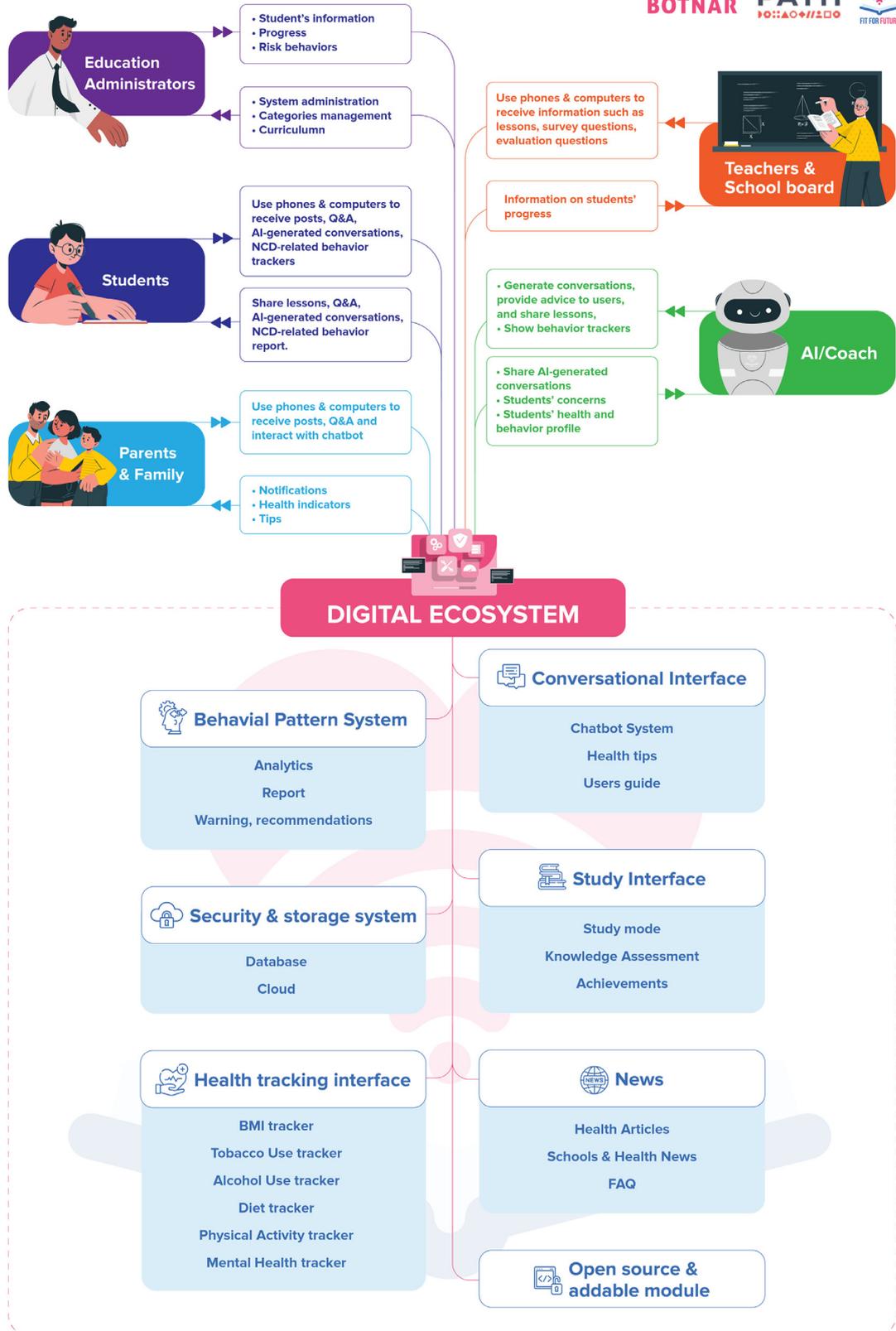


Figure 2. Digital learning ecosystem of the app.

behaviors on the body (e.g., following smoke inhalation through the body to see how it affects organs and how it shows externally). Using artificial intelligence, the app will collect user data to provide positive messages and timely suggestions to encourage and motivate activity, a balanced diet, and adoption of other healthy behaviors, as well as build a bank of questions and answers tailored to youth.

Data collected via the app will be de-identified (per the developer's privacy policy), and personal information of the users will not be visible to those with administrative access. Data will be aggregated and presented in count and percentage formats over a given time period at different managerial levels. Teachers will be able to see up-to-date numbers and percentages of the students from their class who registered for the application, completed the e-lessons, and provided information on risk behaviors and their declared risk behaviors—noting that usernames will not be visible. School managers will have access to such information but from the school level, while educational authorities at district, provincial, and ministry levels will see information at their respective levels. Educational authorities will also provide data regarding the programming progress, such as how many classes in a school are teaching the e-lessons, how many schools in a district are deploying the NCD prevention program, etc. Visible metrics will be made in real-time at the city and school levels, agreed upon by the government, to nudge participants to increase healthy behaviors.

In addition to delivering education in and outside of schools, the app can be integrated on social media platforms (e.g., Facebook, TikTok, and Zalo) to have maximum youth reach and access and collect data analytics. Built-in quizzes can also be used to assess youth knowledge of NCDs. The project leverages smartphones and wearable devices to deliver objectives and collect insightful data on the program's effectiveness. These learnings can be used to develop future policies to promote health among this age cohort.

The Fit for the Future project combines internet- and mobile-based interventions and formal health education at school to raise awareness about NCDs and risk factors, forming a comprehensive online and offline ecosystem. The project also recognizes the dynamic social environment around young people, as well as their potential to be the agent of change. The project hopes to not only improve youth's NCD literacy but also empower them to influence their families, peers, and others.

Projected impact

The Fit for the Future project takes a user-centered design approach by enabling students who are, or could someday be, personally affected by NCDs to help shape appropriate and impactful health programs and

interventions for today and for the youth of tomorrow. The project strategy is prevention-focused, aligning with the 2015–2025 Vietnam National Strategy on Prevention and Control of NCDs. The national strategy sets a target for adult hypertension prevalence to be below 30% and diabetes to be below 8% among individuals 30 to 69 years old. Because we know risky adolescent behavior is associated with increased risk of developing NCDs in adulthood, this can have a long-lasting impact on Vietnam's youth.

The anticipated immediate effects on the youth population include increased knowledge and awareness of healthy behaviors, increased physical activity (e.g., steps walked), improved youth vital statistics (e.g., blood pressure, body mass index, etc.), and increased engagement of youth and their support networks for activities promoting healthy behaviors. The initial results from data collected through the app and school assessments will also provide enhanced information on NCD-related behaviors among adolescents. As the program is sustained for the long term, we can expect to see improved health among youth and boosted confidence for healthy decision-making (i.e., healthier eating, more physical activity, and reduced tobacco and alcohol consumption) and a more interactive and effective youth physical education curriculum. Based on findings of the final project evaluation, as well as available resources, MOET will consider scaling up the educational program to a large population of youth at subnational and national levels. And although the information collected during this pilot project will be stored and utilized within the education sector, there is future potential to collaborate with the Ministry of Health to integrate the app with the existing health system.

The Fit for the Future project aims at reinforcing healthier behaviors and NCD knowledge during the critical adolescent period. However, as students graduate from school and transition into the workforce or undergraduate study, the range of their social interactions expands significantly beyond the basic family and school circles, thereby potentially exposing youth to other risky behaviors and situations. Therefore, to help them maintain healthy habits and behaviors for NCD prevention into adulthood, a more holistic approach is required. The following strategic interventions should be considered: (i) establishing policies and regulation systems specifically aimed at curbing risky behaviors among youth, (ii) modifying educational and workplace environments to enable youth to practice healthy behaviors, (iii) advocating for NCD prevention and including youth as agents of change, as well as connecting them to the larger community of shared interests (e.g., a support group for smoking cessation), and (iv) providing digital and/or outreach services for knowledge, support, and referral to health services.

Contributors

The project proposal was written by TNH, HNTN, and LNT. LM drafted the manuscript, while TNH, HM, and HNTN critically reviewed and made additions to the manuscript.

Declaration of interests

We declare no competing interests.

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