frontiers | Frontiers in Education

TYPE Community Case Study
PUBLISHED 13 November 2024
DOI 10.3389/feduc.2024.1498753



OPEN ACCESS

EDITED BY
Aimee Quickfall,
Leeds Trinity University, United Kingdom

REVIEWED BY
Patricia Galvez Espinoza,
University of Chile, Chile
Anthea Rose,
University of Lincoln, United Kingdom

*CORRESPONDENCE
Stacey Johnson
✉ stacey.johnson@ico.unicancer.fr

RECEIVED 19 September 2024
ACCEPTED 28 October 2024
PUBLISHED 13 November 2024

CITATION
Johnson S, Laham S, Blanc S and Bellanger M (2024) Cultivating partnerships to incorporate health promotion modules into primary school curricula: a case study in France. *Front. Educ.* 9:1498753. doi: 10.3389/feduc.2024.1498753



# Cultivating partnerships to incorporate health promotion modules into primary school curricula: a case study in France

Stacey Johnson[1,2]*, Sandy Laham[1], Samantha Blanc[3] and Martine Bellanger[1]

[1]Institut de Cancérologie de l'Ouest, Saint-Herblain, France, [2]UMR1319 INSPIRE, Université de Lorraine, Vandœuvre-lès-Nancy, France, [3]École Primaire Nelson Mandela, Saint-Herblain, France

School-based health promotion (HP) emerged from the settings-based approach. Children from disadvantaged neighborhoods benefit from HP in their school. Teachers deliver HP modules but need additional resources. This case study aimed to form a transdisciplinary partnership in a socially disadvantaged area to co-develop and embed HP modules into existing curricula. A 3-stage framework was used in this study. Stage 1 cultivated partnerships, reviewed evidence and existing data. Stage 2 generated ideas and co-developed HP modules. Stage 3 trialed the modules within primary school classrooms. Stage 1 resulted in a partnership between city authorities, a primary school and a comprehensive cancer center all located in the same community in France. The reviewed data and evidence provided 18 examples of school-based HP programs and showed that the school is in a highly disadvantaged neighborhood with a large immigrant population. Stage 2 developed 3 HP modules: "Taste and Science Week," "Nutrition Weeks," and "Breakfast Week," each embedded as add-ins into existing math and science lessons and workshops. Finally, stage 3 trialed the modules in 10 first to fifth grade classrooms impacting 214 total students. Transdisciplinary partnerships help co-create and support evidence-driven HP programs. This collaborative approach enabled primary school teachers to effectively embed the HP modules into pre-existing math and science curricula. Families and volunteers are an integral part of successful HP programs however, limited participation was a challenge. Further research is needed to evaluate indicators such as student academic success and health behavior change.

KEYWORDS

**participatory research, intervention implementation, school-based approach, children, disadvantaged communities, primary school, health promotion**

## Introduction

Emerging from the settings-based approach to health promotion (HP), health-promoting schools (HPS) is a global concept to support healthy behaviors among schoolchildren and staff. With origins from the Ottawa Charter (World Health Organization, 1986), the "Schools for Health in Europe" (SHE) aims to increase HP activities at regional and local levels (Darlington et al., 2021). This framework highlights five factors of a health-promoting school: 1- "the school curriculum promotes health topics, 2- health is promoted through informal means, 3- staff are included in HP actions, 4- the HP curriculum is supported by health services, and 5- HP actions include student's families and the surrounding community" (WHO and UNESCO, 2021).

School-based HP can be particularly beneficial for schoolchildren in socially disadvantaged communities where social determinants of health (SDH) are often linked with factors such as poverty, high unemployment and low educational achievement (Gibson and Asthana, 1998; Lupton, 2004). Children in disadvantaged communities are at higher risk of experiencing poor housing conditions with safety concerns at home, unsafe neighborhoods, food insecurity, a lack of access to green spaces and racial/ethnicity bias (Marmot and Bell, 2019; Shonkoff et al., 2009; Thornton et al., 2016). These issues make it particularly difficult for children to participate in healthy behaviors such as physical activity and balanced dietary habits which can affect brain development and cognitive control (Marmot and Bell, 2019). Thus, schools can act as supportive environments and play positive roles to promote student health (Stattin et al., 2019). When designing school-based interventions it is crucial to consider the social and economic context of the target population considering they may influence an intervention's impact. For instance, parental commitment or availability to support their children during an intervention is often limited in disadvantaged families, whereas extracurricular HP activities may not fit into already overbooked agendas from advantaged families (Farias et al., 2023; Kalubi et al., 2023).

Previous research reports barriers and facilitators to successful school-based HP implementation. School reported barriers include lack of understanding about the concept of HP, overloaded schedules, lack of time or knowledge to develop HP curriculum, divergent political goals and few resources (Melo et al., 2013; St Leger, 2000). Other factors substantially contribute in facilitating successful HPS programs such as common goals, sufficient resources, parental involvement, school organizational environment, supportive leadership, health policies, implementation strategies and capacity building (Thornton et al., 2016; Fung et al., 2012; Hoover et al., 2021; Langford et al., 2015; McIsaac et al., 2015; Sánchez et al., 2014; Van Dongen et al., 2022; Viig and Wold, 2005; Whelan et al., 2018). Teachers play an essential role in the success of HP programs within their classrooms. Therefore, to overcome some barriers and operationalize the evidence-driven facilitators, incorporating HP lessons into existing curricula can be an effective solution (Bentsen et al., 2020; Burt et al., 2017). Although valid, teachers often require external support to plan and implement these HP lessons.

To improve health and wellbeing of schoolchildren within the SHE framework, it is important to build community capacity and foster collaborations with partners who support and participate in project development and implementation to sustain positive change WHO and UNESCO, 2021; van Dongen et al., 2023). Actions and support can come from many different actors including local governments, health agencies, community members or the specific setting itself (Deschesnes et al., 2003). Therefore, the aim of this study was to: (1) create a collaborative, sustainable partnership between city officials, a primary school in a socially disadvantaged neighborhood and a comprehensive cancer center located within the community and (2) co-develop and implement health promotion curriculum modules embedded into existing math and science classes.

The present paper describes a school-based case study using the concept of Transdisciplinary Action Research (TDAR; Stokols, 2006) to promote health within an underserved primary school. TDAR was created to guide multidisciplinary teams in the identification of social issues and foster collaborative efforts to develop practical solutions. A major strength is from the focus of identifying key stakeholders within a setting and including their participation during the conception, development, implementation and evaluation stages to increase acceptability and sustainability of interventions.

This project was part of and financed through the National Education Ministry of France under the comprehensive school-based program launched in 2022 called, "*Notre école faisons-la ensemble—NEFE* (We make our school together)" and approved under France's National Council for Education Reform (CRN #1505523). In July 2023, 4.4% of all primary and secondary schools voluntarily developed a project under the NEFE framework (https://www.education.gouv.fr/les-chiffres-cles-du-systeme-educatif-6515; Conseil National de la Refondation, 2023). In the Pays de la Loire region, NEFE projects focused on equal opportunities, student wellbeing and excellence at school.

# Methods

A qualitative, iterative design with a participatory research methodology was used to develop the collaboration and HP curriculum modules. This case study used a 3-stage framework to co-produce content, resources and delivery using a convenience sample of one primary school in a disadvantaged neighborhood in France. Stage-1 consisted of cultivating a partnership and reviewing evidence and existing data. Stage-2 included idea generation and co-producing HP modules including curriculum add-ins and workshops (Bentsen et al., 2020; Barfod et al., 2021). Finally, stage-3 trialed the HP modules within the school's day-to-day curriculum (Hawkins et al., 2017; see Figure 1).

## Stage 1—developing partnerships and reviewing evidence and existing data

### Developing partnerships

In France, the National Ministry of Education is "the authority for primary education, including curricula and teachers. Primary school buildings belong and are managed by municipalities" (European Commission, 2024). Therefore, the first stage of the project began with consulting city administrators to provide insight into the city of Saint-Herblain and health objectives for its disadvantaged neighborhoods and contacts with schools in these neighborhoods. Once these objectives were assessed, HP researchers from a comprehensive cancer center (ICO) within the city were identified by matching skills and interest in promoting community and school health.

Over a series of exchanges including, meetings, emails, telephone calls, and video conferences, stakeholders were identified; consequently a target school in a disadvantaged neighborhood was chosen. The school's needs were then assessed based on stakeholder capacities, interests and resources. Discussions were conducted with the school team including

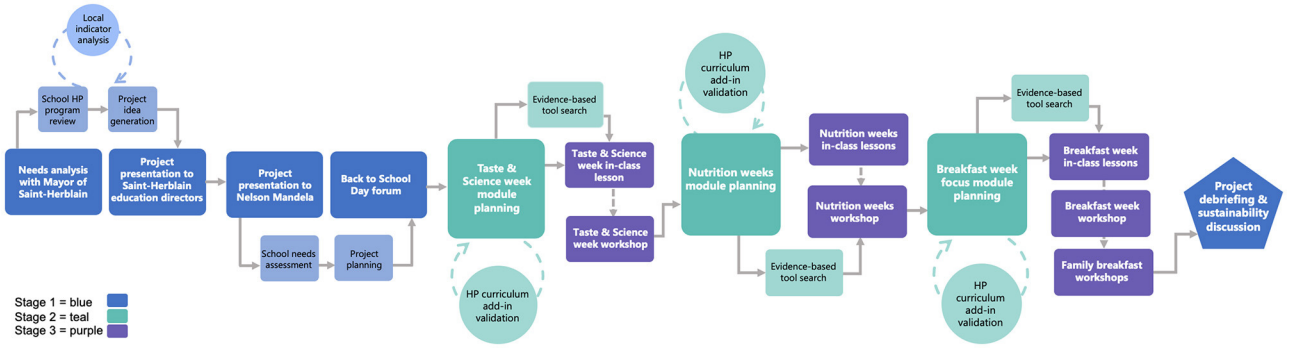


FIGURE 1
Project development stages.

the director, teachers and the parent's association president to further define specific expectations, resources, classroom needs, and finalize partnership responsibilities (Crawford et al., 2008). Extensive notes were taken during all meetings and idea generation sessions.

### Reviewing evidence and existing data

The ICO research team analyzed secondary data to understand the specific context, using local area indicators, including socioeconomic characteristics and children's health outcomes. In addition, this team conducted an evidence review to conceptualize HP initiatives within the school context. Evidence reviews are employed to advise researchers of the most current data; often used for targeted searching based on researcher's subject knowledge and previously used data (Haby et al., 2016). The evidence review protocol included establishing criteria to search for primary data sources focusing on HP programs that included nutrition, physical activity or gardening conducted in primary schools. The search included articles published in English from 2010 to 2023. Data were synthesized from both published peer reviewed articles from PubMed and Google Scholar and gray literature reports found on school and government websites in French and English. Last, based on the gathered data, a preliminary HP school-related project was drafted to initiate discussion with the local partners.

## Stage 2—co-developing health promotion modules

Preliminary meetings were held with the school team to define objectives and discuss how HP topics could be designed into modules that align with France's National Education Ministry requirements (Ministrère de l'Education Natioale et de la Jeunesse, 2024). A module consists of all in-class lessons, workshops and supplementary teaching materials. Each module consisted of in-class HP curriculum add-ins and supplementary hands-on workshops. HP "add-ins" typically take the form of short lessons integrated into the current education curriculum rather than curriculum "add-ons" which are lessons that are in addition to current curriculum requirements. This approach has been successfully implemented in previous school-based HP programs (Bentsen et al., 2020).

A series of on-site meetings (2 per module) and online exchanges took place between June 2023 and May 2024 to develop HP modules to embed into the current math and science curriculum. The first meeting generated ideas for the HP lesson add-ins, with a second follow-up meeting conducted to plan coordinating workshops, validate the lesson content and finalize the module.

Work was divided among the team with the transdisciplinary team agreeing upon all HP subjects, the school teachers developed the HP lesson add-ins and members from the ICO team researched and provided support tools. The lead teachers have a scientific background, and experience with developing curricula for schoolchildren between 7 and 11 years old. Within the ICO team, two members have experience developing content for university level public health and health promotion courses. HP add-in module validation was necessary to ensure that content was accurate, age appropriate and aligned with French national education standards. HP add-ins to include in the curriculum were based on previous HP projects, the evidence review conducted during stage 1 along with the school's needs assessed as described above. Curriculum additions also took into consideration available support resources including human, material and financial. Therefore, the school requested a part-time math and science teacher dedicated to working with students during the in-class HP lessons. The project team recorded the development process through detailed field notes, participation records and communication with all partners. To reinforce HP curriculum add-ins, partners co-developed age-appropriate hands-on HP workshops which required additional support from partner volunteers, donations and dedicated time.

## Stage 3—implementing HP modules

Partners tested the feasibility of embedding validated HP add-ins into existing math and science lessons with students. Although incorporating the modules was not obligatory, they were shared

with teachers from 1st to 5th grade classes. The school team coordinated dates to integrate the HP lesson add-ins into the curriculum according to their yearly academic planning. While in-class dates were flexible, the workshops had pre-defined dates to allow student interaction with other classes and grade levels. Hands-on HP workshops were scheduled to take place shortly after the HP add-in lessons with the aim of reinforcing what students had learned in class. Parents were sent emails with information regarding each hands-on workshop inviting them to volunteer and/or attend. Additionally, a few days prior to each workshop, students were sent home with reminder flyers. Modules were supported with age-appropriate teaching materials (e.g., boardgames, books, videos, posters, and websites). Members from the ICO team were present during at least one workshop from each module. To assess the final workshop, a satisfaction survey was conducted on-site with parents via the *Wooclap*$^{TM}$ application. All in-class HP lessons and workshops were planned for implementation between October 2023 and June 2024.

# Results

## Stage 1—developing partnerships and reviewing evidence and existing data

### Developing partnership

During the needs assessment with the city team from Saint-Herblain, the mayor expressed a need to focus on improving health conditions in socially disadvantaged neighborhoods with the objective to "*improve health and education options such as green spaces, activities, test scores, and food choices for schoolchildren*." Therefore, the primary school Nelson Mandela, within the Sillon de Bretagne neighborhood, was identified as the partner school due to their favorable disposition toward the project and their location within a socially disadvantaged neighborhood.

The transdisciplinary team comprised members from ICO, Saint-Herblain's city administration and school staff from Nelson Mandela. The ICO team included three researchers: a professor of health economics who is also the HP and prevention department head, a research expert in HP through physical activity and a nutritionist holding a public health master's degree. This team was responsible for providing knowledge and expertise in the domains of science, nutrition and physical activity, conducting data collection, HP content idea generation and lesson validation, supplying tool resources, on-site workshop assistance and external team communication. The city administrator team consisted of two members from the mayoral office and three professionals from the local department of education. They provided administrative contact details for Nelson Mandela's school director and supplemental financial resources to support workshop implementation. Finally, the school team consisted of Nelson Mandela's director, two lead teachers, one from 2nd grade the other from 5th grade and the parent's association president. This team was responsible for idea generation, HP module development and delivery and internal school communication with other staff and student families.

Preliminary exchanges with the school team in May 2023 allowed the ICO team to share HP project ideas, solidify the partnership and conduct the school's needs assessment. In June 2023, agreement was made to co-develop a project and ideas were generated focusing on nutrition components that could be implemented within the school's NEFE project "equality through math and science," as described in stage 2 (see Figure 1).

In September 2023, a kick-off workshop was implemented at the annual "Back-to-School Day" to launch the collaboration. This schoolwide event welcomes all school staff, students and their families, gives them an opportunity to meet their teachers, see classrooms and introduces them to school activities and extracurricular offers such as sports and arts clubs. This event offered an opportunity for the ICO team to be visible on the school campus, meet the parent's association and become familiar with students and families. Three interactive activities were conducted: (1) matching seasonality of fruits and vegetables, (2) adding weights of fruits and vegetables to match that of a fictional family, and (3) a jumping-jack challenge with a quiz based on physical activity recommendations for children.

### Reviewing evidence and existing data

According to the National Institute of Statistics and Economic studies, Saint-Herblain has a population of about 50,000 inhabitants (2020 census; Insee, 2023). Within Saint-Herblain, one fifth of the neighborhoods, representing 15% of the population, are classified as "disadvantaged areas," including Sillon de Bretagne. This neighborhood has 2,700 total inhabitants, half of whom live in a "priority area," which is one of the 20th poorest neighborhoods in France. This community is largely composed of immigrant populations with a poverty rate of 64% (Observatoire de la pauvreté, 2022). The target school, Nelson Mandela, served 380 total students coming from over 35 countries in the 2023–24 academic year. Despite its sociodemographic composition, Nelson Mandela does not qualify for France's "reinforced priority education network (REP+)." This program targets schools with student populations from disadvantaged communities who often do not speak French. It reduces primary classroom sizes allowing more personal attention to students so they have the same opportunities as others (European Commission, 2024).

The investigation for evidence-driven HP programs in similar settings yielded 18 results: six gray literature sources, two university programs, and 10 peer-reviewed articles. The programs focused on nutrition ($n = 14$), physical activity ($n = 3$), or incorporated a mix of both ($n = 2$). Programs were implemented both during regular school hours and peri-scholar, with many incorporating a school-based garden as the primary intervention component (Hoover et al., 2021; Davis et al., 2015; Landry et al., 2021; Lohr et al., 2021; Monferrer et al., 2022) or adding physical activity options such as walking 1-mile before school (Breheny et al., 2020; Butler et al., 2011; Morris et al., 2019; Qi et al., 2021). In general, analysis of the programs showed that participants increased their fruit and vegetable intake and their willingness to try new foods at school and home, increased academic achievement, increased PA behaviors, better peer and teacher relationships, increased knowledge of nutrition and executive functioning improved (Landry et al., 2021; Lohr et al., 2021; Morris et al., 2019; Qi et al., 2021; Jenkinson Kate et al., 2014). Many of these programs were implemented in

disadvantaged schools (see Supplementary material 1). From the initial multicomponent project the ICO team drafted, the school team suggested focusing on nutrition components to develop the HP modules.

## Stage 2—co-developing HP modules

The teams from ICO and Nelson Mandela met over a series of seven meetings to brainstorm and plan HP modules which included curriculum add-ins and hands-on workshops. Based on the needs analysis conducted during stage 1, the modules allowed the teachers to develop equality through math and science and go further into scientific learning to engage their students and elicit a sense of curiosity through hands-on experimentation. The team developed and validated three different HP modules throughout the year to integrate into the curriculum (see Figure 2).

The first module was titled "Taste and Science week" with the lead teachers developing the in-class lessons based on nutrition science of the cycle of life of apples. The ICO team researched age-appropriate support tools and educational resources including items such as a nutrition boardgame (Le p'tit toque), a child-based food pyramid and informative nutrition websites with interactive tools for children (mangerbouger.fr, www.lapomme.org, tabledesenfants.com) Three hands-on workshops were developed for this module: (1) a visit to an apple orchard, (2) blinded apple taste test, and (3) a cooking lab. The second module was titled "Nutrition Weeks" and spanned 5-weeks. The curriculum add-ins were developed for students to understand different types of diets, categories of foods, energy benefits of foods, and the concept of balanced diets. The coordinating workshop, in week 5, had students work in groups to classify foods based on the food pyramid and macro nutrients. Finally, the third module, titled "Breakfast week," focused on creating healthy breakfasts. Add-in lessons were based around students moving through stations to discover common breakfast foods, create appetizing breakfasts with pictures and drawing what they eat for breakfast. This module's workshop invited student families to the school for a healthy breakfast (see Table 1). After each module, the transdisciplinary team met to discuss implementation feedback in order to improve subsequent modules. After validation by the team, all modules were made available to teachers from 1st grade (CP) to 5th grade (CM2) via the shared school drive (see Supplementary material 2 for modules).

## Stage 3—implementing HP modules

In total, 214 students from 1st grade (CP) to 5th grade (CM2) participated in at least one module throughout the 2023–2024 academic year. The "Taste and Science Week" module was implemented in all 10 classes with the two 1st grade teachers slightly modifying the curriculum to adapt to a younger age group (6–7 years old). The "Nutrition Weeks" module was conducted by eight classes with the 1st grade classes not implementing this module and the 4th and 5th grade classes modifying it to adapt to the higher grade level. Finally, the "Breakfast Weeks" module was conducted by three classes, 2nd, 3rd, and 5th grade, with families from all of the classes being invited to participate in the workshop. In order to welcome as many families as possible, these workshops were conducted over 4 consecutive Mondays with the children developing balanced menus during the lesson add-ins. In total, 49–55 people were registered for each of the four breakfast workshops. However, on average about half of those registered actually attended.

Each in-class lesson for the HP add-ins lasted between 30 and 45-min incorporated into the math or science classes while the hands-on workshops were scheduled for 60-min to complement math and science curricula. During each in-class lesson, at least one volunteer helped facilitate the add-ins. Because workshops were resource intensive, 4–5 volunteers helped and additional financial support was required, for instance, purchasing ingredients for cooking labs, breakfasts and teaching materials such as posters, games and handouts. A total of 20 responses were received from a workshop satisfaction survey reporting that, 85% were satisfied with the breakfast workshop experience. Only 10% of respondents thought that their typical breakfast was "always" balanced, whereas 45% responded "sometimes" or "rarely." Sixty percent of the respondents said they were "missing fruits and vegetables" and 25% mentioned "protein" was missing from their daily breakfasts. Three quarters of participants responded that this was a learning experience, with comments such as "learning about food categories," "adding oats into yogurt" and "not to forget fat" when planning meals. Only, one respondent mentioned that "*their children already knew*" the information. More than half of respondents (55%) said they would reproduce the breakfast at home, 35% responded with "maybe" and only 10% said "no." One responded commented that "it is difficult to get children to like and try new things." Finally, 100% responded that they enjoyed themselves during the breakfast.

# Discussion

This case study provides insights into building collaborative partnerships to implement HP modules in a primary school located in a disadvantaged community in France. It adds to the growing body of evidence suggesting HPS needs support with development, implementation and capacity building (McIsaac et al., 2015; van Dongen et al., 2023, 2021). This is especially true when considering schools in disadvantaged communities which often have less resources and overtaxed teachers, proving to be barriers to HP implementation (St Leger, 2000).

Although the lead teachers were motivated to develop an HP project under the NEFE framework, they needed external assistance. Therefore, the current study created a collaborative partnership to help develop the school team's capacity and provide multiple resources for teachers to implement HP modules. This collaborative approach enabled the primary school teachers to effectively modify and embed the HP modules into math and science curricula, as reported in similar studies (Bentsen et al., 2020). This reflects the school's ability to strengthen its "*capacity as a setting for healthy living, learning and working*" as defined in the SHE framework (Darlington et al., 2021; WHO and UNESCO, 2021; van Dongen et al., 2023). Studies suggest that HPS, which

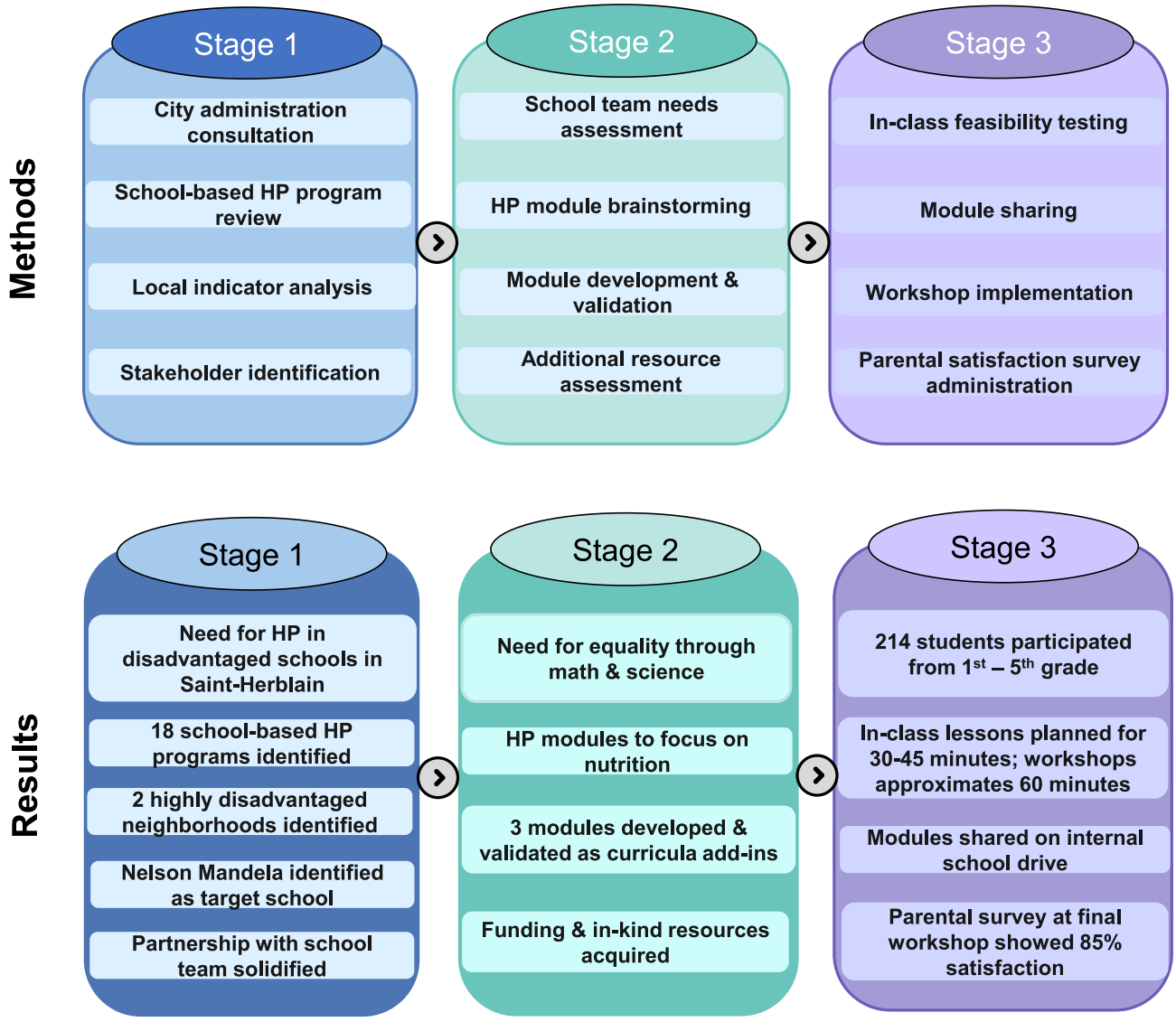


FIGURE 2
Project stages from methods to results.

benefit from external collaborations, gain outside perspectives, increase sustainability and community capacity building (van Dongen et al., 2023, 2021). Consistent with other studies (McIsaac et al., 2015; Boot et al., 2010), the school and city teams recognized that the contribution of external experts was vital in the planning and implementation of HP modules. Interacting with the schoolchildren allows them to benefit from scientific projects, which is not always as readily available in disadvantaged schools compared to advantaged counterparts (OCDE, 2012, 2019). According to the teachers, students reported increased interest in math and science lessons when incorporating real-world HP applications, such as those during group workshops. Working together and combining classes from several grade levels encourages an enriched learning experience, social interactions and allows older students to become peer assistants which increases the adoption of healthy behaviors (Bentsen et al., 2020; Jenkinson Kate et al., 2014; Dodd et al., 2022).

HP modules were successfully implemented in various forms in all 1st through 5th grade classrooms nevertheless, several classes had to modify certain aspects to better coordinate with their agendas and student's grade level. This finding reminds us that HPS is not "one-size-fits-all" approach (Judd et al., 2001) but rather HP modules should be flexible to fit with different timetables, interests, grade levels and vulnerabilities. Additionally, when planning modules, it helps to have both in-class learning followed-up by hands on activities (Bentsen et al., 2020) such as the developed workshops. Not only does this reinforce the classroom lesson but it touches on various learning styles which has proven to be important when learning new skills, especially for at risk children (Carbo and Hodges, 1988). During the final meeting, a lead teacher mentioned that some of the workshops "*may be too disconnected from the students' everyday reality*" and therefore promoting healthy behaviors need to be repeated and supported in many settings where children live to elicit long-term behavior

TABLE 1 Health promotion modules.

| Modules | Actions | Teaching tools |
|---|---|---|
| M1- "*Taste & Science week*" curriculum add-ins | Focus on apples with scientific teaching about the lifecycle of apples, identify parts of an apple, seasonality of different apple varieties, nutritional value of eating apples | Age-appropriate books, videos, flyers, posters, and student handouts |
| M1- "*Taste & Science week*" hands-on workshops | All activities in the same week: 1-walk to an orchard, discover the different parts of an apple, talk to a farmer about the stages of planting a seed to growing the apple, different varieties of apples, differences in taste, use, pick apples (physical activity included through walking to the orchard); 2- Blind taste testing using senses to identify apple varieties, quiz on the parts of an apple and stages of life; 3- follow a recipe to collectively cook an apple crumble in groups (math and reading skills: measuring ingredients, following directions, leading a team) | Apple crumble recipe, ingredients provided for all workshops |
| M2- "*Nutrition weeks*" curriculum add-ins | Once per week over 4 consecutive weeks: Week 1- survey regarding typical breakfast, teaching the origins of foods; discuss different types of diets (vegetarian, carnivore, omnivore, etc.); what animals eat these diets; Week 2- bodily requirements for foods and functions in the body, categorization of foods; Week 3- food pyramid teaching, students classify foods into the food pyramid; Week 4- teaching based on balanced meals, what to eat in 1-meal, 1-day and 1-week, reinforce food functioning in body | Pedagogical websites, children's nutrition boardgame |
| M2- "*Nutrition weeks*" hands-on workshop | Week 5- in groups, students classify foods into "good" and "bad" columns, they present their results and discuss their classification choice | Folder with food pictures |
| M3- "*Breakfast weeks*" curriculum add-ins | Students participate in small groups, station 1- showed a picture of common breakfast foods and students write the name (helps with spelling) and classify it into the food pyramid, station 2- students choose foods from an envelope and create a meal that looks appetizing, nutritious and balanced, station 3- students draw what they ate that morning, write the name of the food and present it to the class | Folder with food pictures, food pyramid poster |
| M3-"*Family breakfast Mondays*" hands-on workshops | Over 4 consecutive weeks, families were invited to breakfast with their child before school, two were sweet and two were savory. Teachers and volunteers went to each table and played games with the children to see if they could recognize the food groups and identify how the body uses each food (i.e., eggs to build strong muscles, oats found in the cereal to give energy for the day and yogurt to build healthy bones). At the end of each breakfast, parents were invited to respond to an online satisfaction survey. | Breakfast ingredients; reinforcement games; satisfaction survey |

M1, module 1; M2, Module 2; M3, Module 3.

change (Lewallen et al., 2015). For example, a systematic review suggested that increasing availability of healthy foods offered at schools combined with peer involvement and support from home may be an effective strategy for sustainable change (Calvert et al., 2019).

Unlike previous studies (van Dongen et al., 2023), the school team excelled at translating generated ideas into an action plan (lesson add-ins and workshops). This may be due in part to the implementation strategies, which are known facilitators (Langford et al., 2015; Whelan et al., 2018) when incorporating HP into school curricula. Similar to previous studies, this case study relied upon the strategy of embedding HP modules as lesson "add-ins" (Bentsen et al., 2020) to not overwhelm the teachers and increase burden on overloaded schedules, which was a reported barrier by teachers in the study by St Leger (2000).

Where this case study seemed to stall was active participation of parents and volunteers. This is a common issue with parental involvement being a resource and an important factor for successful HP implementation with their children but also a previously reported challenge (Clelland et al., 2013). Other settings, such as sports clubs have also encountered challenges of engaging volunteers during HP implementation (Donaldson et al., 2021). Some parents may face hesitancy to participate in school programs, due to language or education barriers (Kalubi et al., 2023) which could be amplified in disadvantaged communities such as Sillon de Bretagne. For example, during the "Breakfast Monday" workshops, parents were invited to attend by signing-up with an online form. Each workshop had 50 places available for students and family members with sign-ups showing full engagement but actual participation during the workshops averaged about half of them. It is worth noting that HP program development is iterative and adjustments must be made to ensure sustainability. An iterative process was necessary to improve from one module to the next. For example, during several hands-on workshops, it was discovered that implementing a workshop first thing in the morning early in the week was poor planning. To address challenges to parental involvement in HP school programs, tailoring the schedule to allow for timely reminders should be one of the implementation strategies to increase successful HPS programs (Thornton et al., 2016; Fung et al., 2012; Langford et al., 2014).

# Practical implications and conclusions

## Practical implications

Schools are a particularly relevant setting to promote healthy behaviors in at-risk children, especially those living in disadvantaged communities. HP programs in this setting must consider the specific nature of the targeted students (i.e., disadvantaged community), those who implement programs (i.e., teachers, volunteers), and how to ensure sustainability (i.e., multi-year program). To increase efficacy, they should reflect the five factors from the SHE framework (Darlington et al., 2021; WHO

and UNESCO, 2021). For example, this case study embedded HP modules in math and science curricula which were reinforced informally though workshops. The school director and lead teachers played an intrinsic role in developing the HP modules and making them accessible throughout the school. They provided additional support to other teachers by responding to questions and helping them implement HP modules. This study was supported by community members including an apple farm, the parent's association and the city's mayor demonstrating the importance of collaborative work to develop and implement the intervention. Finally, families and volunteers were invited to participate in workshops to support the program. Sustainability is a concern when promoting health, especially in schools in disadvantaged communities. Using HP modules integrated into curricula is a previously used strategy to improve sustainability (Burt et al., 2017). Therefore, additional HP modules are planned to extend over 2-years with one module implemented in each academic period (5 per year). This allows for healthy nutrition reinforcement through multiple themes across grade levels.

## Limitations

Several limitations to this case study should be noted. First, this study only included one school in a disadvantaged neighborhood to test the feasibility of embedding HP module into existing curricula. Future studies can benefit from scaling-up to increase the number of schools to overcome issues related to selection bias, sample size and transferability. Second, no formal evaluation was conducted outside of the final meeting with the lead teachers. Analyzing results through qualitative interviews with teachers, students and families and quantitative data such as academic performance and dietary changes, will help prove efficacy of HPS programs and allow for more evidence-driven result reporting. Finally, this study was limited to 1 academic year. However, the study to extend to the following academic year to reinforce learned knowledge and increase sustainability.

## Conclusions

This case study reinforces the idea that school-based HP requires motivated partners willing to co-create HP initiatives. Partnerships between transdisciplinary teams help co-create and support evidence-driven programs. Results from this study strengthen the argument that teachers require additional resources and support from leadership within their school. Additionally, they can greatly benefit from experts to generate ideas and help develop flexible HP modules and embed them in daily curricula. Similar HP initiatives can go far beyond one school by reaching more families, multiple schools and including neighboring communities. Further research is needed to evaluate indicators such as sustainability, transferability, student performance and health behavior change in the short and long-term. From a global context, although this case study was developed and implemented within a French elementary school, elements and ideas were drawn from the evidence review which included several countries such as the United States, England, France, and Australia. Thus, it has increased the evidence that health promotion within schools can be a transdisciplinary, valuable undertaking for all stakeholders including the school's staff, community partners, students, and families.

## Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

## Ethics statement

The studies involving humans were approved by National Council for Education Reform. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required from the participants or the participants' legal guardians/next of kin because intervention was provided during school hours within current curricula. Written informed consent was not obtained from the minor(s)' legal guardian/next of kin, for the publication of any potentially identifiable images or data included in this article because no images were included in this publication, intervention was within school confines.

## Author contributions

SJ: Conceptualization, Data curation, Investigation, Methodology, Validation, Writing – original draft, Writing – review & editing. SL: Conceptualization, Investigation, Methodology, Resources, Validation, Writing – review & editing. SB: Conceptualization, Funding acquisition, Investigation, Project administration, Supervision, Writing – review & editing. MB: Conceptualization, Data curation, Investigation, Methodology, Resources, Supervision, Validation, Writing – original draft, Writing – review & editing.

## Funding

The author(s) declare financial support was received for the research, authorship, and/or publication of this article. The authors declare that financial support was received for the research and implementation of the HP modules from the mayoral office of Saint-Herblain mayoral office and from the NEFE program.

## Acknowledgments

The authors would like to show their appreciation to all the stakeholders who took part in this case study including the mayor of Saint-Herblain and his staff, all of the teachers, administration, students, and families from the Nelson Mandela Primary School. The authors are grateful to the ICO director for his support throughout the project.

## Conflict of interest

The authors declare that the research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

## Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

## Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2024.1498753/full#supplementary-material

## References


Barfod, K., Bølling, M., Mygind, L., Elsborg, P., Ejbye-Ernst, N., Bentsen, P., et al. (2021). Reaping fruits of labour: revisiting education outside the classroom provision in Denmark upon policy and research interventions. *Urb. For. Urb. Green*. 60:127044. doi: 10.1016/j.ufug.2021.127044

Bentsen, P., Bonde, A. H., Schneller, M. B., Danielsen, D., Bruselius-Jensen, M., Aagaard-Hansen, J., et al. (2020). Danish 'add-in' school-based health promotion: integrating health in curriculum time. *Health Promot. Int*. 35, e70–e77. doi: 10.1093/heapro/day095

Boot, N., Van Assema, P., Hesdahl, B., and De Vries, N. (2010). Professional assistance in implementing school health policies. *Health Educ*. 110, 294–308. doi: 10.1108/96542831080001393

Breheny, K., Passmore, S., Adab, P., Martin, J., Hemming, K., Lancashire, E. R., et al. (2020). Effectiveness and cost-effectiveness of The Daily Mile on childhood weight outcomes and wellbeing: a cluster randomised controlled trial. *Int. J. Obes*. 44, 812–822. doi: 10.1038/s41366-019-0511-0

Burt, K. G., Koch, P., and Contento, I. (2017). Implementing and sustaining school gardens by integrating the curriculum. *Health Behav. Pol. Rev*. 4, 427–435. doi: 10.14485/HBPR.4.5.2

Butler, J., Fryer, C. S., Reed, E. A., and Thomas, S. B. (2011). Utilizing the school health index to build collaboration between a university and an urban school district. *J. School Health* 81, 774–782. doi: 10.1111/j.1746-1561.2011.00657.x

Calvert, S., Dempsey, R. C., and Povey, R. (2019). Delivering in-school interventions to improve dietary behaviours amongst 11- to 16-year-olds: a systematic review. *Obes. Rev*. 20, 543–553. doi: 10.1111/obr.12797

Carbo, M., and Hodges, H. (1988). Learning styles strategies can help students at risk. *Teach. Except. Child*. 20, 55–58. doi: 10.1177/004005998802000416

Clelland, T., Cushman, P., and Hawkins, J. (2013). Challenges of parental involvement within a health promoting school framework in New Zealand. *Educ. Res. Int*. 2013, 1–8. doi: 10.1155/2013/131636

Conseil National de la Refondation (2023). *2ème édition des journées portes ouvertes : des projets pour faire notre école ensemble*. Paris: Ministère de l'éducation nationale.

Crawford, J. K., Cabanis-Brewin, J., Bigelow Crawford, D., and Pennypacker, J. S. (2008). *Project Management Roles and Responsibilities, 2nd Edn*. Glen Mills, PA: Center for Business Practices, 113.

Darlington, E., Bada, E., Masson, J., Santos, R. M., Simovska, V., Schulz, A., et al. (2021). *European Standards and Indicators for Health Promoting Schools Version 2.0*. Hadersley: Schools for Health in Europe Network Foundation (SHE).

Davis, J. N., Spaniol, M. R., and Somerset, S. (2015). Sustenance and sustainability: maximizing the impact of school gardens on health outcomes. *Publ. Health Nutr*. 18, 2358–2367. doi: 10.1017/S1368980015000221

Deschesnes, M., Martin, C., and Hill, A. J. (2003). Comprehensive approaches to school health promotion: how to achieve broader implementation? *Health Promot. Int*. 18, 387–396. doi: 10.1093/heapro/dag410

Dodd, S., Widnall, E., Russell, A. E., Curtin, E. L., Simmonds, R., Limmer, M., et al. (2022). School-based peer education interventions to improve health: a global systematic review of effectiveness. *BMC Publ. Health* 22:2247. doi: 10.1186/s12889-022-14688-3

Donaldson, A., Staley, K., Cameron, M., Dowling, S., Randle, E., O'Halloran, P., et al. (2021). The challenges of partnering to promote health through sport. *Int. J. Environ. Res. Publ. Health* 18:7193. doi: 10.3390/ijerph18137193

European Commission (2024). *France Primary Education System*. Available at: https://eurydice.eacea.ec.europa.eu/national-education-systems/france/primary-education (accessed September 3, 2024).

Farias, L., Nyberg, G., Helgadóttir, B., and Andermo, S. (2023). Adolescents' experiences of a school-based health promotion intervention in socioeconomically advantaged and disadvantaged areas in Sweden: a qualitative process evaluation study. *BMC Publ. Health* 23:1631. doi: 10.1186/s12889-023-16581-z

Fung, C., Kuhle, S., Lu, C., Purcell, M., Schwartz, M., Storey, K., et al. (2012). From "best practice" to "next practice": the effectiveness of school-based health promotion in improving healthy eating and physical activity and preventing childhood obesity. *Int. J. Behav. Nutr. Phys. Act*. 9:27. doi: 10.1186/1479-5868-9-27

Gibson, A., and Asthana, S. (1998). School performance, school effectiveness and the 1997 white paper. *Oxf. Rev. Educ*. 24, 195–210. doi: 10.1080/0305498980240204

Haby, M. M., Chapman, E., Clark, R., Barreto, J., Reveiz, L., Lavis, J. N., et al. (2016). What are the best methodologies for rapid reviews of the research evidence for evidence-informed decision making in health policy and practice: a rapid review. *Health Res. Pol. Syst*. 14:83. doi: 10.1186/s12961-016-0155-7

Hawkins, J., Madden, K., Fletcher, A., Midgley, L., Grant, A., Cox, G., et al. (2017). Development of a framework for the co-production and prototyping of public health interventions. *BMC Publ. Health* 17:689. doi: 10.1186/s12889-017-4695-8

Hoover, A., Vandyousefi, S., Martin, B., Nikah, K., Cooper, M. H., Muller, A., et al. (2021). Barriers, strategies, and resources to thriving school gardens. *J. Nutr. Educ. Behav*. 53, 591–601. doi: 10.1016/j.jneb.2021.02.011

Insee (2023). *Populations légales 2020—Commune de Saint-Herblain*. Etudes et Statistiques. Available at: https://www.insee.fr/fr/statistiques/6676182?geo=COM-44162 (accessed September 8, 2024).

Jenkinson Kate, A., Naughton, G., and Benson, A. C. (2014). Peer-assisted learning in school physical education, sport and physical activity programmes: a systematic review. *Phys. Educ. Sport Pedag*. 19, 253–277. doi: 10.1080/17408989.2012.754004

Judd, J., Frankish, C. J., and Moulton, G. (2001). Setting standards in the evaluation of community-based health promotion programmes- a unifying approach. *Health Promot. Int*. 16, 367–380. doi: 10.1093/heapro/16.4.367

Kalubi, J., Riglea, T., O'Loughlin, E. K., Potvin, L., and O'Loughlin, J. (2023). Health-promoting school culture: how do we measure it and does it vary by school neighborhood deprivation? *J. Sch. Health* 93, 659–668. doi: 10.1111/josh.13304

Landry, M. J., van den Berg, A. E., Hoelscher, D. M., Asigbee, F. M., Vandyousefi, S., Ghaddar, R., et al. (2021). Impact of a school-based gardening, cooking, nutrition intervention on diet intake and quality: the TX sprouts randomized controlled trial. *Nutrients* 13:3081. doi: 10.3390/nu13093081

Langford, R., Bonell, C., Jones, H., Pouliou, T., Murphy, S., Waters, E., et al. (2015). The World Health Organization's Health Promoting Schools framework: a cochrane systematic review and meta-analysis. *BMC Publ. Health* 15:130. doi: 10.1186/s12889-015-1360-y

Langford, R., Bonell, C. P., Jones, H. E., Pouliou, T., Murphy, S. M., Waters, E., et al. (2014). The WHO Health Promoting School framework for improving the health and well-being of students and their academic achievement. *Cochr. Datab. Syst. Rev*. 4:CD008958. doi: 10.1002/14651858.CD008958.pub2

Lewallen, T. C., Hunt, H., Potts-Datema, W., Zaza, S., and Giles, W. (2015). The Whole School, Whole Community, Whole Child model: a new approach for improving educational attainment and healthy development for students. *J. Sch. Health* 85, 729–739. doi: 10.1111/josh.12310

Lohr, A. M., Krause, K. C., McClelland, D. J., Van Gorden, N., Gerald, L. B., Del Casino, V., et al. (2021). The impact of school gardens on youth social and emotional learning: a scoping review. *J. Advent. Educ. Outdoor Learn*. 21, 371–384. doi: 10.1080/14729679.2020.1838935

Lupton, R. (2004). *Schools in Disadvantaged Areas: Recognising Context and Raising Quality*. Centre for Analysis of Social Exclusion. Available at: http://sticerd.lse.ac.uk/Case (accessed September 4, 2024).

Marmot, M., and Bell, R. (2019). Social determinants and non-communicable diseases: time for integrated action. *Br. Med. J.* 364:l251. doi: 10.1136/bmj.l251

McIsaac, J. L. D., Mumtaz, Z., Veugelers, P. J., and Kirk, S. F. L. (2015). Providing context to the implementation of health promoting schools: a case study. *Eval. Progr. Plan*. 53, 65–71. doi: 10.1016/j.evalprogplan.2015.08.003

Melo, H., De Moura, A. P., Aires, L. L., and Cunha, L. M. (2013). Barriers and facilitators to the promotion of healthy eating lifestyles among adolescents at school: the views of school health coordinators. *Health Educ. Res*. 28, 979–992. doi: 10.1093/her/cyt077

Ministrère de l'Education Natioale et de la Jeunesse (2024). *Le Bulletin Officiel de L'éducation Nationale*. éduscol. Available at: https://eduscol.education.fr/4087/niveaux (accessed September 16, 2024).

Monferrer, L., Lorenzo-Valentín, G., and Santágueda-Villanueva, M. (2022). Mathematical and experimental science education from the school garden: a review of the literature and recommendations for practice. *Educ. Sci*. 12:47. doi: 10.3390/educsci12010047

Morris, J. L., Daly-Smith, A., Archbold, V. S. J., Wilkins, E. L., and McKenna, J. (2019). The Daily MileTM initiative: exploring physical activity and the acute effects on executive function and academic performance in primary school children. *Psychol. Sport Exerc*. 45:101583. doi: 10.1016/j.psychsport.2019.101583

Observatoire de la pauvret é (2022). *Les vingt quartiers prioritaires de la ville les plus pauvres de France*. Available at: https://inegalites.fr/Les-vingt-quartiers-prioritaires-les-plus-pauvres-de-France (accessed September 8, 2024).

OCDE (2012). *Equity and Quality in Education*, 168. Available at: https://www.oecd-ilibrary.org/content/publication/9789264130852-en (accessed September 9, 2024).

OCDE (2019). *PISA 2018 Results (Volume II)*, 376. Available at: https://www.oecd-ilibrary.org/content/publication/b5fd1b8f-en (accessed September 9, 2024).

Qi, Y., Hamzah, S. H., Gu, E., Wang, H., Xi, Y., Sun, M., et al. (2021). Is school gardening combined with physical activity intervention effective for improving childhood obesity? a systematic review and meta-analysis. *Nutrients* 13:2605. doi: 10.3390/nu13082605

Sánchez, V., Hale, R., Andrews, M., Cruz, Y., Bettencourt, V., Wexler, P., et al. (2014). School wellness policy implementation: insights and recommendations from two rural school districts. *Health Promot. Pract*. 15, 340–348. doi: 10.1177/1524839912450878

Shonkoff, J. P., Boyce, W. T., and McEwen, B. S. (2009). Neuroscience, molecular biology, and the childhood roots of health disparities: building a new framework for health promotion and disease prevention. *J. Am. Med. Assoc*. 301, 2252–2259. doi: 10.1001/jama.2009.754

St Leger, L. (2000). Reducing the barriers to the expansion of health-promoting schools by focusing on teachers. *Health Educ*. 100, 81–87. doi: 10.1108/09654280010312469

Stattin, H., Svensson, Y., and Korol, L. (2019). Schools can be supporting environments in disadvantaged neighborhoods. *Int. J. Behav. Dev*. 43, 383–392. doi: 10.1177/0165025419833824

Stokols, D. (2006). Toward a science of transdisciplinary action research. *Am. J. Commun. Psychol*. 38, 63–77. doi: 10.1007/s10464-006-9060-5

Thornton, R. L. J., Glover, C. M., Cené, C. W., Glik, D. C., Henderson, J. A., Williams, D. R., et al. (2016). Evaluating strategies for reducing health disparities by addressing the social determinants of health. *Health Aff*. 35, 1416–1423. doi: 10.1377/hlthaff.2015.1357

Van Dongen, B. M., De Vries, I. M., Ridder, M. A. M., De Boer, M., Steenhuis, I. H. M., Renders, C. M., et al. (2022). Building community capacity to stimulate physical activity and dietary behavior in Dutch secondary schools: evaluation of the FLASH intervention using the REAIM framework. *Front. Publ. Health* 10:926465. doi: 10.3389/fpubh.2022.926465

van Dongen, B. M., de Vries, I. M., Ridder, M. A. M., Renders, C. M., and Steenhuis, I. H. M. (2021). Opportunities for capacity building to create healthy school communities in the Netherlands: focus group discussions with Dutch Pupils. *Front. Publ. Health* 9:630513. doi: 10.3389/fpubh.2021.630513

van Dongen, B. M., Ridder, M. A. M., Wolters, L., Steenhuis, I. H. M., and Renders, C. M. (2023). Increasing community capacity to improve the implementation of Health Promoting Schools: barriers and facilitators from the FLASH intervention. *Health Promot. Int*. 38:daad115. doi: 10.1093/heapro/daad115

Viig, N. G., and Wold, B. (2005). Facilitating teachers' participation in school-based health promotion-a qualitative study. *Scand. J. Educ. Res*. 49, 83–109. doi: 10.1080/0031383042000302146

Whelan, J., Love, P., Millar, L., Allender, S., and Bell, C. (2018). Sustaining obesity prevention in communities: a systematic narrative synthesis review. *Obes. Rev*. 19, 839–851. doi: 10.1111/obr.12675

WHO and UNESCO (2021). *Making Every School a Health-Promoting School: Global Standards and Indicators for Health-Promoting Schools and Systems*. Geneva: WHO and UNESCO. Available at: https://apps.who.int/iris/rest/bitstreams/1352165/retrieve (accessed September 10, 2024).

World Health Organization (1986). *The Ottawa Charter for Health Promotion*. Available at: http://www.who.int/healthpromotion/conferences/previous/ottawa/en/ (accessed July 31, 2018).