

Sintra Grows Healthy: Development and implementation of a food literacy curriculum for primary schools

Telma Nogueira^{1,2,*}, Raquel J. Ferreira^{3,4*}, Marta Sócrates¹, Vitória Dias da Silva¹, Mariana Liñan Pinto¹, Rute Borrego⁴, Joana Sousa^{1,2}

¹Laboratório de Nutrição, Faculdade de Medicina, Universidade de Lisboa, Avenida Professor Egas Moniz, Edifício Egas Moniz, ala C, piso 2, 1649-028, Lisboa, Portugal

²Instituto de Saúde Ambiental, Faculdade de Medicina, Universidade de Lisboa, Avenida Professor Egas Moniz, Edifício Egas Moniz, ala C, piso 0, 1649-028, Lisboa, Portugal

³Câmara Municipal de Sintra, Departamento de Educação, Juventude e Desporto, Largo Dr. Virgílio Horta, 2714-501, Sintra, Portugal

⁴Escola Superior de Tecnologia da Saúde de Lisboa, Instituto Politécnico de Lisboa, Avenida D. João II, Lote 4.69.01, 1990-096, Lisboa, Portugal

****Corresponding author:** Telma Nogueira, Avenida Professor Egas Moniz, Edifício Egas Moniz, ala C, piso 2, 1649-028, Lisboa, Portugal 1649-028 Lisboa, Portugal, telmanogueira@medicina.ulisboa.pt

*Contributed equally to this work.

Short title: Development of a food literacy curriculum



This is an Accepted Manuscript for Public Health Nutrition as part of the Cambridge Coronavirus Collection. This peer-reviewed article has been accepted for publication but not yet copyedited or typeset, and so may be subject to change during the production process.

The article is considered published and may be cited using its DOI

10.1017/S1368980022000180

Public Health Nutrition is published by Cambridge University Press on behalf of The Nutrition Society

Acknowledgements: We would like to acknowledge the school community for their involvement and crucial role in Sintra Grows Healthy.

Financial Support: Sintra Grows Healthy is funded by the Municipality of Sintra (7819008155) and was co-funded by Gulbenkian Academies of Knowledge, Calouste Gulbenkian Foundation (231980).

Conflict of Interest: None

Authorship: TN, RJF, RB, and JS contributed to the initial design. TN and RJF coordinate the study implementation, fieldwork, data collection and methodological and operational adjustments. TN, RJF, MS, and VDS developed, implemented, reviewed, and updated manual. TN, RJF, MS, VDS and MLP collected the process evaluation data. All authors contributed to further discussion and critically revised the manuscript. All authors read and approved the final manuscript.

Ethical Standards Disclosure: This study was conducted according to the guidelines laid down in the Declaration of Helsinki and **all procedures involving research study participants were approved by the** Lisbon Academic Medical Centre ethics committee (401/17), the National Data Protection Commission (11468/2017), and the Ethics Boards of each participating school. Written informed consent **was obtained** from the children's legal guardian.

Abstract

Objective: Describe the process of development and implementation of *Health at the Table* - a food literacy curriculum for primary school aged children.

Design: Through a community-based research process, *Health at the table* development and implementation took place in four stages: exploratory study, production, implementation, and monitoring.

Setting: Primary schools of Sintra's municipality, Portugal.

Participants: Children (6 to 10 years), teachers, school staff and children's legal guardians of three primary schools during the pilot project and eight primary schools in the second year.

Results: During the needs assessment phase, 99.1% (n=341) of the children's legal guardians, 100% (n=34) of the teachers and 100% (n=19) of the school staff considered that the school plays an important or very important role in children's food literacy (stage 1). During the pilot project, a manual with 60 session plans was developed (stage 2). In the second year *Health at the Table* was implemented by 72 trained teachers during one school year (stage 3). Most of the teachers agreed that the curriculum was appropriate (69.2%) and that children developed health, wellness/well-being, and environmental skills (83.1%). Most of the children said they had learned about healthy eating (86.3%) and claimed to eat healthier since the *Health at the Table* implementation (58.9%) (stage 4).

Conclusions: *Health at the Table* is a food literacy curriculum that can be reproduced in similar contexts in a sustainable way. The need to combine educational strategies with a healthy school food environment is reinforced to increase effectiveness in tackling childhood obesity.

Keywords: Curriculum, Food literacy, Nutrition education, Health promotion, School.

Background

Obesity is a complex system of distinct and interrelated factors associated with significant short and long-term negative consequences for individuals and societies⁽¹⁻³⁾. Thus, preventing obesity is a public health priority⁽⁴⁾.

In Portugal, the prevalence of children under 10 years old with obesity and pre-obesity is, respectively, 7.7% and 17.3%⁽⁵⁾; 12% of children aged 6 to 8 years are obese and 29.6% are overweight⁽⁶⁾. In the primary schools of Sintra's municipality the prevalence changes to 12.6% obese and 23% overweight⁽⁷⁾, a high percentage when compared to other regions in Europe⁽⁷⁾.

International^(4,8,9) and national^(10,11) guidelines state that municipalities are promising spaces for improving children's nutritional status and that they play a crucial role in tackling childhood obesity.

Schools constitute an important setting for promoting health, food literacy and nutrition education⁽¹²⁾, establishing healthy behaviours⁽¹³⁾, protecting and supporting good nutrition in children and their families and communities^(14,15). Food literacy and nutrition education in schools can be incorporated in different ways from the basic curriculum to extracurricular activities^(12,14,16). In addition, school is an excellent setting for communicating health-promoting messages to the entire school community⁽¹⁴⁾. A health-promoting school implements structured and systematic plans considering well-being, health, and social development for students, teaching and non-teaching staff⁽¹⁷⁾, principles supported by the Convention on the Rights of the Child⁽¹⁸⁾, the Ottawa Charter⁽¹⁹⁾ and, the Schools for Health in Europe Network Foundation⁽²⁰⁾.

Health-promoting interventions are more effective if they are initiated early⁽²¹⁾ and if there is agreement on the attitudes and responsibility of the family, school and community^(14,16). Also, there is some evidence of the effectiveness of school interventions to improve weight status and increase physical activity, when supported by the health-promoting school model⁽²²⁾.

The National Health Education Referential⁽²³⁾ is a flexible tool of voluntary implementation that establishes topics and objectives for health education in the school environment, namely in the context of nutrition education according to schooling year.

There are several nutrition interventions described in the literature, but the authors found no detailed manuscripts regarding the development and implementation of specific food literacy tools. To strengthen food literacy and nutrition education in primary schools, the Municipality of Sintra implemented an intervention to promote healthy lifestyles - Sintra Grows Healthy

⁽²⁴⁾. Therefore, this study aims to describe the process of development and implementation of *Health at the Table* - a food literacy curriculum for primary school aged-children, specifically developed in the context of the larger intervention “Sintra Grows Healthy” ⁽²⁴⁾.

Methods

The study was developed using data from the Sintra Grows Healthy intervention ⁽²⁴⁾. Sintra Grows Healthy intervention follows a community-based participatory research methodology and focuses on school community actors. A food and nutrition curriculum named *Health at the Table* is one of the axis of the intervention and consists of weekly sessions of food literacy and nutrition education ⁽²⁴⁾. For the implementation of this axis, the Sintra Grows Healthy team developed a food literacy curriculum and a specific manual to support its implementation, whose process is hereby described.

Participants

During the pilot project 467 children and legal guardians, 27 teachers, and 19 school staff coming from 22 classes of three primary schools belonging to one school cluster participated in *Health at the Table*. During the second school year of intervention, the number of participants increased to 1734 children and legal guardians, 98 teachers, and 40 school staff coming from 77 classes of eight primary schools belonging to three school clusters.

Procedure

The development and implementation of *Health at the Table* began in the 2017/2018 school year and took place in four stages (**Figure 1**).

Stage 1 – Exploratory study

The first stage entailed the completion of a needs assessment questionnaire, consisting of both closed and open-ended questions, in one school cluster with three primary schools and 22 classes. The questionnaire was administered to children’s legal guardians (20 items), teachers (23 items), and school staff (21 items). The close-ended questions intended to evaluate healthy eating habits and attitudes in primary school children, the importance of food literacy as well as the school setting and its significant role for health promotion (e.g., “School plays a key role in education and promoting healthy eating behaviours.”), using a 5-point Likert scale. The open-ended questions aimed to collect suggestions and improvement opportunities.

Simultaneously, a literature review on optimal food and nutrition education practices for primary school children was conducted to gather evidence to support the curriculum development^(20,22,23).

Stage 2 – Production

Six thematic areas and their respective objectives were defined aligned with the National Health Education Referential⁽²³⁾: i) Food and culture, ii) Food, nutrition, and health, iii) Food and emotions, iv) Food cycle: from the producer to the consumer, v) Safe cooking and vi) Food sustainability.

A multidisciplinary team, with registered dietitian/nutritionists, psychologists, and primary school teachers, developed, applied, and reviewed session plans for each thematic area. These session plans included both theoretical and practical activities, such as recognising healthy or unhealthy snacks, consulting nutrition labelling, checking the adequacy to children's energy and nutritional needs or presenting solutions to reduce food waste at school. The manual provides the contents organised for each schooling level allowing connection with the basic curriculum subjects (Maths, Science and Portuguese).

Health at the Table was implemented by a multidisciplinary team as an extracurricular activity.

At the end of the school year, the process evaluation was performed. Children answered a self-reported 3-item questionnaire, using a 3-choice smile scale: if they enjoyed *Health at the Table*, if they learnt something about healthy eating and if their eating habits became healthier.

In the same way, similar questionnaires were applied, both in close and open-ended questions, to children's legal guardians (6-item), teachers (12-item), and school staff (6-item). The close-ended questions, on a 5-point Likert scale, included specific questions related to *Health at the Table* (e.g., "Children enjoyed *Health at the Table*?"). The open-ended questions aimed to collect suggestions and improvement opportunities.

Stage 3 – Implementation

In the second school year, after the pilot project, *Health at the Table* was no longer implemented as an extracurricular activity but integrated in the school curriculum as "complementary offer"- a mandatory curriculum component established in Portuguese law. Complementary offer is considered a new mandatory attendance subject (not covered in the basic curricular matrices) that has its own identity and curriculum documents⁽²⁵⁾. Through

curricular flexibility and articulation, the complementary offer allows the curriculum to be enriched with knowledge, skills and attitudes that contribute to achieving the competencies provided in the Profile of Students after Leaving Compulsory Education, particularly in the area of wellness, health and environment ⁽²⁶⁾. Thus, in the second school year *Health at the Table* was put into practice by the responsible teacher of each class. To ensure that the content was properly delivered to children, Sintra Grows Healthy developed a 50-hour certified training for all teachers. The training was divided into six modules, one for each thematic area in the curriculum, and was conducted by trainers certified by the National Scientific-Pedagogical Council of Continuing Education ⁽²⁷⁾. *Health at the Table* was applied by the trained teachers of three school clusters.

Stage 4 – Monitoring

The monitoring occurred through a weekly submission form into an on-line platform for each food literacy session applied by the teacher. In this submission, teachers answered 17 questions (e.g., date of application, children's competencies achieved, activity adequacy, and improvement opportunities). In addition, a similar process evaluation was performed, as described in stage 2. With the information obtained in stage 4, the curriculum is continuously reviewed and updated by the Sintra Grows Healthy team. Also, this monitoring will allow to perform the impact assessment considering other facets of process evaluation such as responsiveness, dose, reach, fidelity, and quality.

Results

A needs assessment (**Stage 1**) was conducted in 22 classes of three primary schools belonging to one school cluster. Questionnaires were applied to all teachers (n=34) and school staff (n=19), and children's legal guardians (n=344). The response rate was 100% for teachers and school staff, and 73.7% for children's legal guardians. All teachers (100%) and 94.7% of school staff agreed that children in primary schools are in a crucial period to develop food literacy and 97.1% of teachers and all school staff (100%) agreed that their school could contribute significantly to nutritional education and to promote healthy eating behaviours. Furthermore, 99.1% of the children's legal guardians, 100% of the teachers and 100% of the school staff considered that the school plays an important or very important role in children's food literacy. Also, 97.6% of the children's legal guardians, 100% of the teachers and 100% of the school staff considered that the school plays an important or very important role preventing childhood obesity. In addition, all teachers considered that there is an opportunity

to work on healthy eating topics at school. Related to the thematic areas, most children's legal guardians considered important or very important to work on these topics at school: Food and culture (98.0%), Food, nutrition, and health (99.1%), Food cycle: from the producer to the consumer (95.3%), Safe cooking (98.5%) and Food sustainability (94.7%).

During the pilot project, a 60-session plan manual was developed (**Stage 2**), divided by six thematic areas, and implemented in 22 classes of one school cluster. The results of specific questions of the process evaluation completed in the pilot project are presented in Graphs 1, 2, 3 and, 4. In addition, in the pilot project, 88.9% (n=16) of the teachers agreed that children developed health, wellness, and environmental skills with *Health at the Table*. Moreover, 66.7% (n=10) of the teachers perceived improvements in children's eating behaviours at the school canteen. Most children's legal guardians (61.2%, n=79) fully agreed or agreed that *Health at the Table* is important for them as educators.

In the second year, when *Health at the Table* became "complementary offer" (**Stage 3**), 72 teachers received a 50-hour certified training to apply the food literacy curriculum in three school clusters.

The results of specific questions of the process evaluation completed in the second year (**Stage 4**) are also presented in **Graphs 1, 2, 3 and 4**. Regarding teachers, 83.1% (n=54) stated that children developed health, wellness, and environmental skills with *Health at the Table*, and 69.2% (n=36) agreed the curriculum was adequate. The percentage of children's legal guardians that fully agreed or agreed that *Health at the Table* is important for them as educators increased in the second year (76.5%, n=361).

Discussion

The theoretical-practical methodology of the *Health at the Table* curriculum, including activities that stimulate observation, discussion, actions, and practice in real-life settings, might have contributed to the improvement of children's food literacy and food and nutrition education⁽²⁸⁾. Evidence shows that better results can be obtained from a learning through playing approach⁽²⁹⁾, and cooking education may positively influence children's food-related preferences, attitudes, and behaviours⁽³⁰⁾.

The involvement of the school community in the participatory development of the curriculum, whenever considering their needs, motivates its application⁽³¹⁾.

As outlined in the literature, the school community agrees that children in this age group are in a critical period to receive food literacy and nutrition education, and school context is an opportunity to work on issues and attitudes associated with healthy eating^(21,32,33).

It was perceived by the school community that most children enjoyed and developed skills with *Health at the Table*. The application of *Health at the Table* by teachers ensures curricular flexibility and articulation, allowing the curriculum to be enriched with the knowledge, skills and attitudes as foreseen by national ^(23,26) and international guidelines ^(20,34).

Most children (66.4% in the pilot project and 58.9% in the following school year) perceived having healthier eating habits after the intervention. There is evidence that food literacy favours the improvement of children's eating habits when transmitted in the school environment and allied to the involvement of the whole school community and local governments ^(35,36).

A higher percentage of children (83.1% in the pilot project and 86.3% in the following school year) reported having learnt new things related to food and nutrition after the intervention. The difference between the percentage of children that perceived having healthier eating habits and that reported having learnt new things might reinforce the argument that knowledge is a necessary but not sufficient factor for changes in behaviours ⁽³⁷⁾.

Evidence on interventions in this field suggests that multi-component approaches ^(17,32,38–40), that integrate the whole community ⁽⁴¹⁾, long-term ^(42,43) and supported by sustainable models ⁽⁴⁴⁾ are more likely to succeed ⁽⁴⁵⁾. Sintra Grows Healthy, that includes *Health at the Table*, presents itself as an intervention that fulfils these criteria.

The need for prior training of teachers to implement this curriculum could be considered as a limitation. However, it is crucial to ensure the transmission of accurate content according to scientific evidence. Also, the study was conducted in eight primary schools in Sintra, limiting the generalisability.

Health at the Table presents itself as an innovative curriculum, through its participatory development methodology. In addition, its success lies in its constant monitoring, which allows short cycles of evaluation-planning-intervention, contributing to meet the emerging needs and interests of the school community.

Conclusion

Health at the Table is a food literacy curriculum, that could be sustainably reproducible in similar contexts. Comprehensive school-based nutrition interventions involve the school community and address multiple components. Thus, the implementation of Sintra Grows Healthy includes the integration of food literacy in the curriculum - *Health at the Table* - as well as the development of policies capable of modifying the school food environment, to support and facilitate the adoption of healthy behaviours, characteristic of a health promoting school.

Abbreviations: not applicable

References

1. Litwin SE (2014) Childhood Obesity and Adulthood Cardiovascular Disease. *J. Am. Coll. Cardiol.* **64**, 1588–1590. Elsevier USA.
2. Reilly JJ & Kelly J (2011) Long-term impact of overweight and obesity in childhood and adolescence on morbidity and premature mortality in adulthood: systematic review. *Int. J. Obes.* **35**, 891–898.
3. Oude Luttikhuis H, Baur L, Jansen H, Shrewsbury VA, O'Malley C, Stolk RP SC (2019) Cochrane Database of Systematic Reviews Interventions for treating obesity in children (Review). .
4. World Health Organization (2018) *Taking Action on Childhood Obesity report*. Geneva: .
5. Lopes C, Torres D, Oliveira A, et al. (2017) *Inquério Alimentar Nacional e de Atividade Física, IAN-AF 2015-2016: Relatório de resultados*. Universidade do Porto.
6. Instituto Nacional de Saúde Dr. Ricardo Jorge (2019) *Childhood Obesity Surveillance Initiative COSI Portugal - 2019: Preliminary data*. .
7. Ferreira RJ & Marques-Vidal PM (2008) Prevalence and Determinants of Obesity in Children in Public Schools of Sintra, Portugal. *Obesity* **16**, 497–500.
8. World Health Organization/Regional Office for Europe (2013) Vienna Declaration on Nutrition and Noncommunicable Diseases in the Context of Health 2020. In *WHO Eur. Minist. Conf. Nutr. Noncommunicable Dis. Context Heal. 2020*, p. 5. Vienna: .
9. Hawkes C, Smith TG, Jewell J, et al. (2015) Smart food policies for obesity prevention. *Lancet* **385**, 2410–2421. Lancet Publishing Group.
10. Assembleia da República (2018) Lei n.º 50/2018. *Diário da República n.º 157*, 4102–4108.
11. Assembleia da República (2013) Lei n.º 75/2013. *Diário da República n.º 176*, 5688–5724.
12. Amin SA, Panzarella C, Lehnerd M, et al. (2018) Identifying Food Literacy Educational Opportunities for Youth. *Heal. Educ. Behav.* **45**, 918–925. SAGE Publications Inc.
13. World Health Organization (2017) *Promoting intersectoral and interagency action for health and well-being in the WHO European Region: working together for better health and well-being*. Paris, France: .

14. World Health Organization (2006) *Food and nutrition policy for schools: A Tool for the Development of School Nutrition Programmes in the European Region*. World Heal. Organ. Copenhagen: .
15. World Health Organization (2018) *Global nutrition policy review 2016-2017: country progress in creating enabling policy environments for promoting healthy diets and nutrition*. [Cadman H, editor]. Geneva: WHO.
16. Food and Agriculture Organization of the United Nations (2006) *Nutrition education in primary schools*. vol. 1. Food and Agriculture Organization of the United Nations.
17. Schools for Health in Europe (2009) *Better Schools Through Health: the Third European Conference on Health Promoting Schools*. Vilnius, Lithuania: .
18. UN General Assembly (1948) Universal Declaration of Human Rights. <https://www.refworld.org/docid/3ae6b3712c.html> (accessed November 2019).
19. World Health Organization (1986) *Ottawa Charter for Health Promotion: First International Conference on Health Promotion*. Ottawa: .
20. Buijs GJ (2009) Better Schools through Health: networking for health promoting schools in Europe. *Eur. J. Educ.* **44**, 507–520.
21. World Health Organization. (2016) *Consideration of the evidence on childhood obesity for the Commission on Ending Childhood Obesity: report of the ad hoc working group on science and evidence for ending childhood obesity, Geneva, Switzerland*. World Heal. Organ. Geneva, Switzerland.: World Health Organization.
22. Langford R, Bonell CP, Jones HE, et al. (2014) The WHO Health Promoting School framework for improving the health and well-being of students and their academic achievement. *Cochrane Database Syst. Rev.* **2014**. John Wiley and Sons Ltd.
23. A. Carvalho; C. Matos; C. Minderico C de A et. al. (2017) *Referencial de Educação para a Saúde*. [Ministério da Educação Direção-Geral da Educação, editor].
24. Ferreira RJ, Nogueira T, Dias da Silva V, et al. (2020) A school-based intervention for a better future: study protocol of Sintra Grows Healthy. *BMC Public Health* **20**, 1615. BMC Public Health.
25. Assembleia da República (2018) Lei n.º 55/2018. *Diário da República n.º 129*, 29228–2943.
26. Martins G d'Oliveira, Gomes CAS, Brocardo J, et al. (2017) *Perfil dos alunos à saída da Escolaridade Obrigatória*. Direção Geral da Educ. [Ministério da Educação, Direção-Geral da Educação, editors].

27. Assembleia da República (2014) Lei n.º 22/2014. *Diário da República n.º 29*, 1286–1291.
28. FAO (2020) *School-based food and nutrition education – A white paper on the current state, principles, challenges and recommendations for low- and middle-income countries*. Rome: .
29. Rosi A, Brighenti F, Finistrella V, et al. (2016) Giocampus school: A ‘learning through playing’ approach to deliver nutritional education to children. *Int. J. Food Sci. Nutr.* **67**, 207–215.
30. Hersch D, Perdue L, Ambroz T, et al. (2014) The impact of cooking classes on food-related preferences, attitudes, and behaviors of school-aged children: A systematic review of the evidence, 2003-2014. *Prev. Chronic Dis.* **11**, 1–10.
31. Oetzel JG, Wallerstein N, Duran B, et al. (2018) Impact of Participatory Health Research: A Test of the Community-Based Participatory Research Conceptual Model. *Biomed Res. Int.* **2018**, 1–12.
32. Brown T, Moore TH, Hooper L, et al. (2019) Interventions for preventing obesity in children. *Cochrane Database Syst. Rev.* John Wiley and Sons Ltd.
33. Food and Agriculture Organization of the United Nations (2005) *Nutrition education in primary schools*. vol. 1.
34. OECD (2016) *OECD Skills Strategy Diagnostic Report: Peru 2016*. Paris: OECD.
35. Nga VT, Dung VNT, Chu DT, et al. (2019) School education and childhood obesity: A systemic review. *Diabetes Metab. Syndr. Clin. Res. Rev.* **13**, 2495–2501. Elsevier Ltd.
36. CDC (2011) School health guidelines to promote healthy eating and physical activity. *Recomm. reports Morb. Mortal. Wkly. Rep.* **60**, 1–76.
37. Worsley A (2002) Nutrition knowledge and food consumption: can nutrition knowledge change food behaviour? *Asia Pac. J. Clin. Nutr.* **11 Suppl 3**, S579–S585.
38. OECD (2019) *The Heavy Burden of Obesity*. [OECD Health Policy Studies, editor]. Paris: OECD Publishing.
39. Graça P & Gregório MJ (2012) Evolução da Política Alimentar e de Nutrição em Portugal e suas Relações com o contexto internacional. *Rev. SPCNA* **8**.
40. Mead E, Brown T, Rees K, et al. (2017) *Diet, physical activity and behavioural interventions for the treatment of overweight or obese children from the age of 6 to 11 years*. *Cochrane Database Syst. Rev.*, vol. 2017. John Wiley and Sons Ltd.
41. Weihrauch-Blüher S, Kromeyer-Hauschild K, Graf C, et al. (2018) Current Guidelines for Obesity Prevention in Childhood and Adolescence. *Obes. Facts* **11**, 263–276.

42. Guerra PH, da Silveira JAC & Salvador EP (2016) Physical activity and nutrition education at the school environment aimed at preventing childhood obesity: evidence from systematic reviews. *J. Pediatr. (Rio. J)*. **92**, 15–23. Elsevier Editora Ltda.
43. World Health Organization (2012) *Population-based approaches to childhood obesity prevention*. *World Heal. Organ.* Geneva, Switzerland.: World Health Organization.
44. Pearson M, Chilton R, Wyatt K, et al. (2015) Implementing health promotion programmes in schools: a realist systematic review of research and experience in the United Kingdom. *Implement. Sci.* **10**, 149.
45. FAO (2019) *School Food and Nutrition Framework*. Rome: .

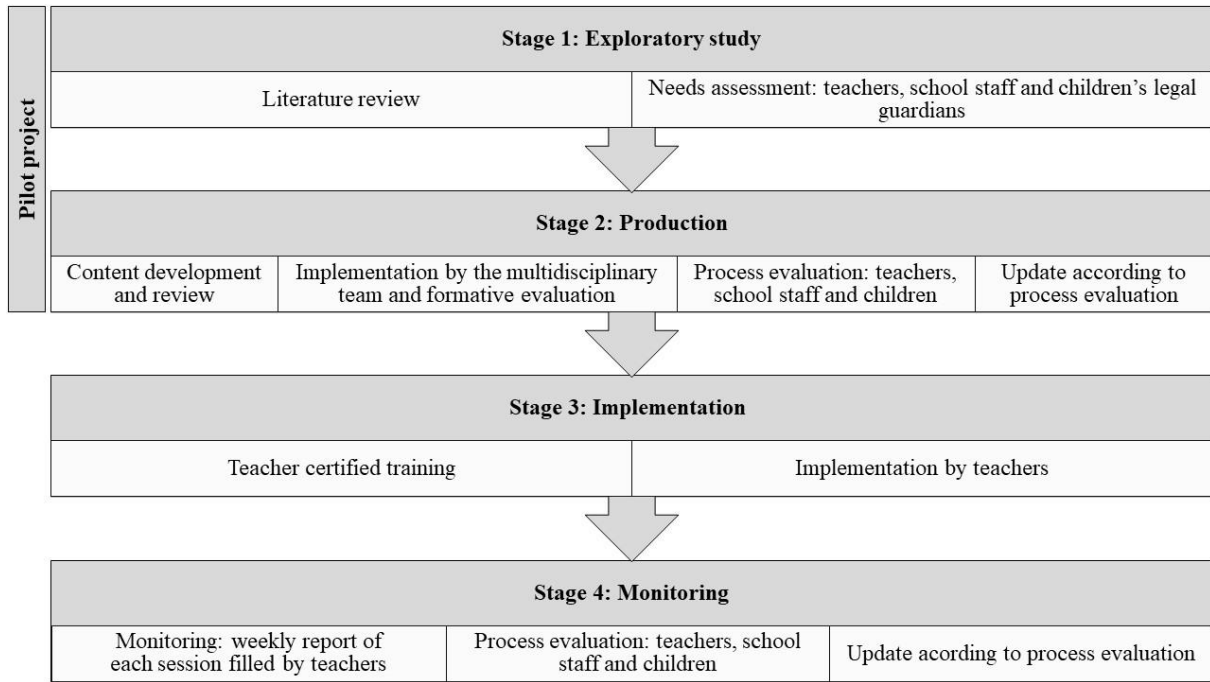


Figure 1 - Health at the Table development and implementation Flowchart