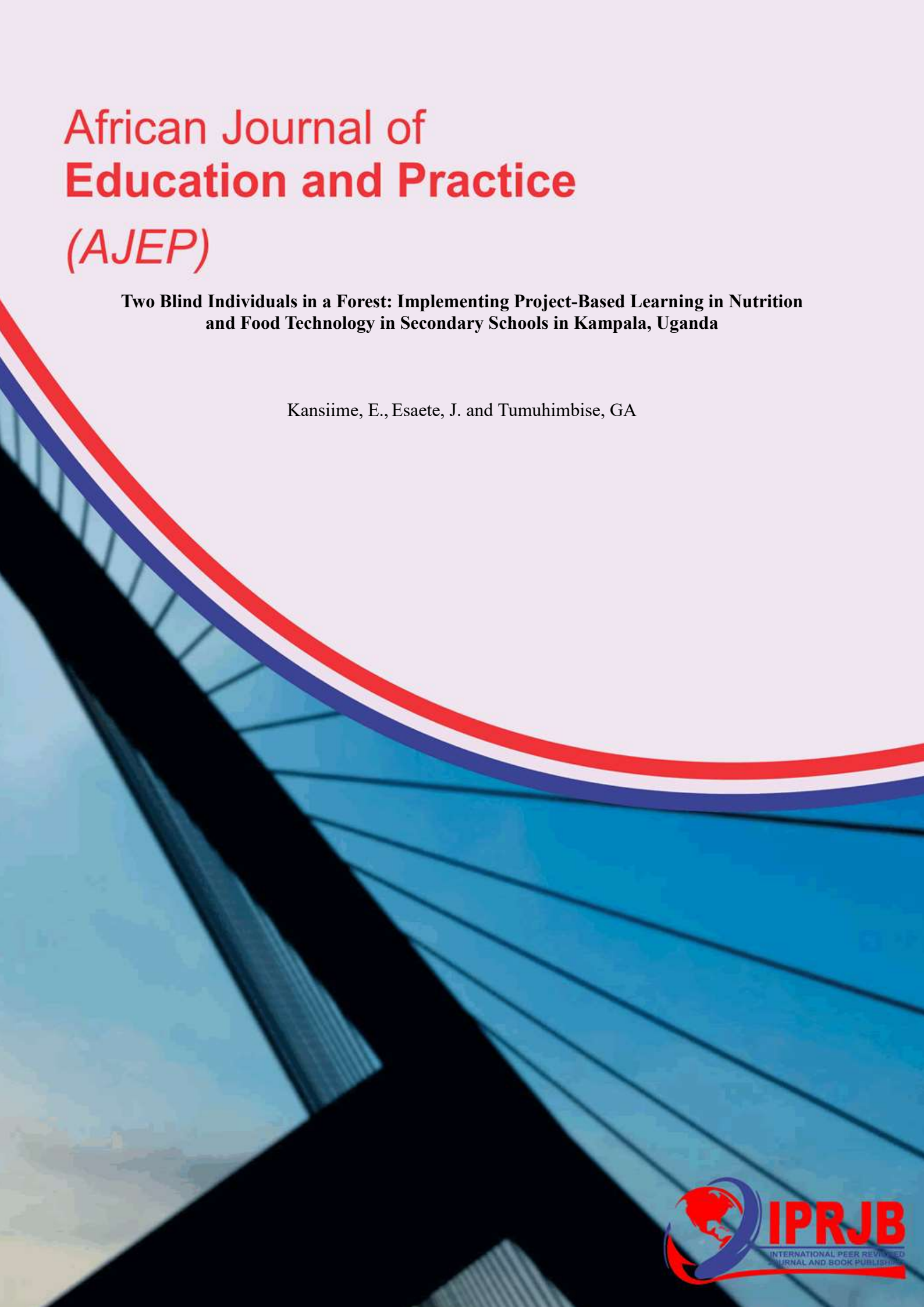
African Journal of
Education and Practice
(AJEP)

Two Blind Individuals in a Forest: Implementing Project-Based Learning in Nutrition and Food Technology in Secondary Schools in Kampala, Uganda

Kansiime, E., Esaete, J. and Tumuhimbise, GA



IPRJB
INTERNATIONAL PEER REVIEWED JOURNAL AND BOOK PUBLISHING

African Journal of Education and Practice
ISSN 2519-0296 (Online)
Vol.10, Issue 5, No.5, pp 78 - 96, 2024

www.iprjb.org

Two Blind Individuals in a Forest: Implementing Project-Based Learning in Nutrition and Food Technology in Secondary Schools in Kampala, Uganda

[1*]Kansiime, E., [1]Esaete, J.
[1]School of Education, Makerere University
[2]Tumuhimbise, GA
[2]School of Food Technology Nutrition and Bioengineering, Makerere University

Article History

Received 5th October 2024

Received in Revised Form 6th November 2024

Accepted 2th December 2024

How to cite in APA format:

Kansiime, E., Esaete, J., & Tumuhimbise, A. (2024). Two Blind Individuals in a Forest: Implementing Project-Based Learning in Nutrition and Food Technology in Secondary Schools in Kampala, Uganda. *African Journal of Education and Practice*, *10*(5), 78–96. https://doi.org/10.47604/ajep.3103

Abstract

Purpose: In this study, we explored how project-based learning is used in Nutrition and Food Technology in Uganda.

Methodology: Using a mixed methods research approach, 12 focus group discussions were conducted with student project group leaders and considered nine for analysis (n = 50) 12 key informant interviews were done with NFT teachers and considered six for analysis because saturation point was reached. Also, quantitative data was collected from 197 learners who were not group leaders using questionnaires.

Findings: The study revealed that the majority of projects in the NFT syllabus were only on food processing with none on topics that link nutrition to health. It further revealed that PBL was used as an additional practice for material taught initially by other means (Mean = 2.72; SD = 0.58), with limited writing of proposals (Mean = 1.47; SD = 0.85) with a narrow focus on 21st-century skills. Also, PBL strongly focused on the originality of the products (Mean = 2.53; SD = 0.82) with overall, an overemphasis on projects for assessment instead of learning.

Unique Contribution to Theory, Practice and Policy: Nutrition and Food Technology (NFT) teachers should use PBL as the central teaching method. The National Curriculum Development Centre's guidance that projects should be done after a topic has been taught should be reviewed. Also, the National Curriculum Development Centre should explore the possibility of reviewing the current NFT syllabus to include projects on nutrition and health.

Keywords: *Nutrition, Food Technology, Project-Based, Learning, Learners, School*

JEL Codes: *I12, I26*

INTRODUCTION

Project-based learning is a method of teaching that organizes learning around projects (Thomas, 2000). It derives mainly from engineering at Aalborg and Roskilde Universities in the 1970s and is said to involve a learning cycle that leads to an exploration of the Problem and the creation of artifacts or products for exhibition (Aydin et al., 2018). A variety of project-based learning models (Grant, 2002; Krajcik et al., 1994; Krajcik & Czerniak, 2013; Thomas, 2000). These models provide ten distinct characteristics without which it ceases to be PBL and include; projects are authentic tasks (Grant, 2002; Hasni et al., 2016; Krajcik & Namsoo, 2014; Thomas, 2000), projects that are central but not peripheral to the curriculum (Thomas, 2000); a driving question (Grant, 2002; Hasni et al., 2016; Krajcik & Namsoo, 2014; Thomas, 2000); project anchoring events or tasks (Hasni et al., 2016); alignment to the curriculum learning goals (Krajcik & Namsoo, 2014; Thomas, 2000); 21st century0 skills (Grant, 2002; Hasni et al., 2016; Krajcik & Namsoo, 2014; Thomas, 2000); artifacts or products for exhibition (Grant, 2002; Hasni et al., 2016; Krajcik & Namsoo, 2014; Thomas, 2000); projects are student-driven (Thomas, 2000); scaffolding as well as opportunities for reflection and transfer (Hasni et al., 2016).

Projects ae not new to nutrition education in schools. findings from the 14 articles shows that projects in school-based nutrition intervention led to improvement in nutrition knowledge articles (Hopper et al., 2005; Hutchinson et al., 2015; Parmer et al., 2009; Gates et al., 2013; Davis et al., 2016; Kostanjevec et al., 2011; Viola, 2006; McCaughty et al., 2011; Scherr et al., 2016; Moitra et al., 2021; Teshome et al., 2023; Schreinemachers et al., 2019). However, they were majorly extracurricular activities except in one study where the projects were part of the formal curriculum (Kostanjevec et al., 2011). Almost half of the studies engaged learners in gardening projects (Hutchinson et al., 2015; Parmer et al., 2009; Davis et al., 2016; Viola (2006); Scherr et al., 2016; Schreinemachers et al., 2019) with less focus on other projects like food processing, post-harvest handling of food, water, sanitation and hygiene and many others.

Problem Statement

All learners are expected to have a good grasp of essential nutrition knowledge to be able to combat malnutrition. However, studies have revealed that 49.9%-54% of secondary school students in Uganda have poor nutrition knowledge (Kusemererwa, 2021; Kyomuhangi et al., 2022). This has majorly been attributed to the predominant use of teacher-centered pedagogies (Abdulwahab, 2018; Ateya et al., 2016; Badrasawi et al., 2021; Mamba et al., 2018; Ndahura, 2012; Okeyo et al., 2020; Oti & Amoah, 2019; Talagala & Arambepola, 2016). Consequently, they have inadequate understanding of essential nutrition concepts, such as balanced diets, the nutritional value of foods, dietary guidelines, and the link between nutrition and health (MOH, 2024; Ndahura, 2012). Although in other disciplines, PBL has been mooted most effective at promoting deep learning, it is newly being implemented in nutrition education syllabus in secondary schools in Uganda and hence not clear on how it is used to facilitate learning. The purpose of this study therefore was to assess the use of PBL in facilitating learning NFT at secondary schools in Uganda.
This study was therefore designed;

1. To assess projects prescribed for learners in the Nutrition and Food Technology syllabus
2. To assess the planning, development, and conclusion of projects in the Nutrition and Food Technology syllabus in secondary schools in Uganda.

African Journal of Education and Practice
ISSN 2519-0296 (Online)
Vol.10, Issue 5, No.5, pp 78 - 96, 2024

www.iprjb.org

Theoretical Perspective

The study was guided by Vygotsky's social learning theory (Vygotsky, 1978). Vygotsky's social learning theory was deemed fit because project-based learning offers an opportunity for learners to share knowledge through the social setting of groups (Darling-Hammond et al., 2019).The social learning theory emphasizes that during learning activity, learners should be scaffolded through the Zone of Proximal Development (ZPD) as they progress from what they already know or can do without assistance to what they can do with a more knowledgeable other (Shabani et al., 2010; Vygotsky, 1978). During the process, learners are expected to take responsibility for their learning with limited support from a teacher or more knowledgeable peer (Darling-Hammond et al., 2019). This applies to project-based learning because PBL is often implemented in group work where learners benefit from the guidance of others with better experiences. Vygotsky's social learning theory is summarized in Figure 1

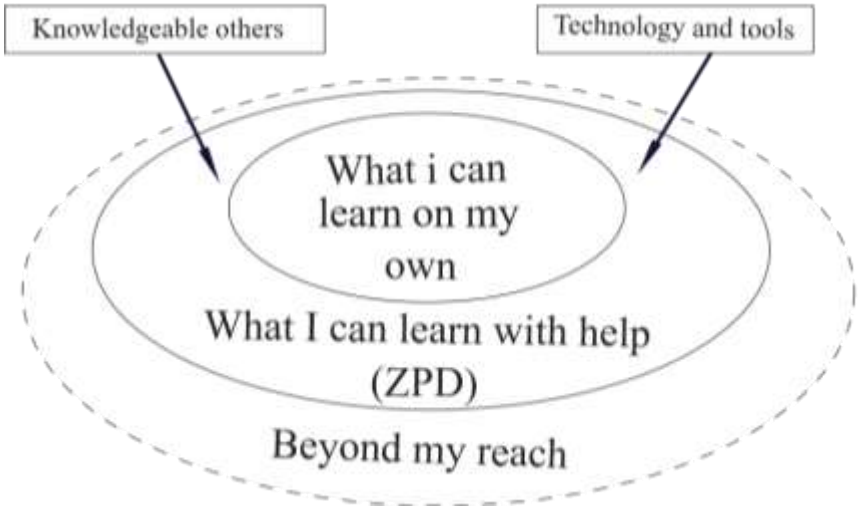


Figure 1: Summary of Vygotsky's Theory of Student Learning (Taber, 2020)

Analysis of Empirical Literature

Much as there is currently increased global access to nutrition knowledge (Dia et al., 2021; Naigaga et al., 2018), a growing number of school-aged children around the world, particularly in developing countries, look to their school curricula to learn about healthy eating and lifestyle habits (Lobstein et al., 2015). Indeed, a systematic review of curricula of 25 African countries including Uganda showed that 75% of them provided basic and accurate nutrition information in the school curriculum (Sarr et al., 2017). In Uganda, this was further emphasized by the government through several policy documents like the Uganda Nutrition Action Plan 1 and 11, the Ministry of Education and Sports guidelines on school feeding and nutrition intervention programs for use in Universal Primary Education (UPE) and Universal Post Primary Education and Training (UPPET) School Systems among others (GoU, 2011, 2013, 2020). This policy background supported the inclusion of a subject, Nutrition and Food Technology in the lower secondary schools' curriculum for Uganda (NCDC, 2010, 2019).

Nutrition education in lower secondary schools in Uganda is undergoing a paradigm pedagogical shift towards the use of experiential learning methods (NCDC, 2019). Among the experiential learning methods, the National Curriculum Development Centre (NCDC), heavily

emphasizes project-based learning (NCDC, 2021). Suggested projects in the lower secondary school curriculum include meal planning, cooking, and meal presentation (NCDC, 2010, 2019), assembling and utilizing water purification equipment; processing and preserving vegetables and fruits; processing meat, fish, and poultry; producing leaflets, and role plays about different nutrition scenarios among others (NCDC, 2019).

Implementation of project-based learning is new to secondary schools in Uganda. Because of this the National Curriculum Development centre (NCDC) gave guides on assessment of projects. These guidelines define a project as an assignment given to the learners individually or in groups to be done over some time with evidence presented in a portfolio (NCDC, 2019). They also gave types of projects that include simple and routine projects that have known short procedures that are used without adjustment and require limited resources; simple and non-routine projects that also involve the use of non-adjusted known procedures that are long, extraordinary but require limited resources; complex and routine projects which are uniquely creative, achievable but do not have known procedures, requires continuous research and demands more resources and highlights creativity; as well as complex and non-routine projects which are uniquely creative, cannot be easily achieved due to uncertainties, being interdisciplinary, demanding high creativity and involve multiple teams with heavy resource investment to implement. They also advised that learners should use locally available and affordable materials as well as how to assess the project with emphasis on the sequential approach of planning, project implementation, and product as well as relevance, accuracy, and coherence of the project report (NCDC, 2021).

Also, the Uganda National Examinations Board released more detailed guidelines on the assessment of projects in 2024 emphasizing that which was earlier given by NCDC (UNEB, 2024). Hence learners will be assessed in projects on their competencies to plan, report, and disseminate projects (UNEB, 2024). During planning, learners are expected to use a template in Appendix 1 to articulate their project ideas by developing a title, the purpose of the project, objectives, and justification, a resources list, and a project activity plan while incorporating knowledge and skills of different subject disciplines, cross-cutting issues and generic skills (UNEB, 2024). During project implementation, learners are assessed on their abilities to gather and use resources, engage stakeholders, create products or services, and demonstrate generic skills (UNEB, 2024). During project reporting, learners are assessed on their abilities to use an appropriate format of the report, use appropriate language in the report, and keep project records (UNEB, 2024). Finally, during dissemination, learners are assessed on their abilities to disseminate the report through speaking or signing, publishing project reports, and demonstrating generic skills (UNEB, 2024). All these are assessed using an observation checklist throughout the project.

Since PBL is newly implemented in Uganda and the existing generic guidelines on PBL are on defining projects and their assessment (NCDC, 2019; UNEB, 2024), there is a vacuum on how PBL is used to enhance learning of nutrition. So, this study was designed to investigate how PBL is used to facilitate learning of nutrition in secondary schools in Uganda.

METHODOLOGY

A mixed methods approach was used in this study to gain in-depth exploration and understanding of learners' experiences as they learned Nutrition and Food Technology through project-based learning. Qualitative data was obtained using self-administered questionnaires having 3 Likert scale items of always, sometimes, and never. Qualitative data was obtained using a self -administered questionnaires given to learners who were not group leaders. Also,

phenomenological approach where learners' lived experiences as they carried out projects in NFT were obtained through focus group discussions with the projects' group leaders and key-informant interviews with teachers of NFT. The purpose was to describe the commonalities of the experience. The study used hermeneutic phenomenology to make meaning out of the lived experience instead of transcendental phenomenology which only looks at the description of experiences.

RESULTS

NFT Projects in Lower Secondary School Biology Syllabus

Except for making a rubbish disposal unit in the school and creating a water purification system, the rest of the projects in the revised lower secondary school curriculum in BNFT are on food processing of meat, fish, poultry, milk, fruits, and vegetables, yeast cookery, confectionaries, and pastries. Seventeen (17) out of 26 essential nutrition topics such as food nutrients, meal planning, and nutrition through the lifecycle among others don't have any project suggested (Table 1). Whereas having projects in all the seven food processing topics is vital, it is equally important to consider including projects in the other remaining 17 topics that emphasize the role of nutrition in health.

Table 1: Projects for Learners in the NFT Syllabus

Class	Topic	Suggested project (s) in the NFT syllabus
Senior One	• Introduction to Nutrition and Food Technology	✓ Learners set up a disposal unit in the school for easy waste management.
	• Kitchen equipment and planning	✓ None
	• Safety in the home	✓ Learners set up a project on water purification to ensure a clean water supply in the school and at home.
	• Proteins	✓ None
	• Carbohydrates	✓ None
	• Mineral elements	✓ None
	• Processing and preservation of vegetables	✓ Processing vegetable pickles, chutney, and sauces.
Senior two	• Lipids	✓ None
	• Vitamins	✓ None
	• Water	✓ None
	• Processing foods from vegetable seeds	✓ Learners process, cost, and sell products made from vegetable seeds.
	• Processing and preservation of fruits	✓ Fruit processing – products will include dried fruit, pickles, chutneys, jam, marmalade, and squashes (fruit juices and drinks).
	• Common foods	✓ None
	• Meal planning	✓ None
Senior three	• Stocks, soups, sauces and gravy	✓ None
	• Sweets and puddings	✓ None
	• Preparation of basic meals	✓ None
	• Meals for special occasions	✓ None
	• Milk and milk products	✓ Process, cost, and sell milk products
	• Yeast cookery	✓ Making bread products and 'bushera' (Fermented millet porridge). Cost and sell the products.
	• Confectioneries and pastries	✓ Making and selling confectioneries and pastry products.
Senior four	• Nutrition and the lifecycle	✓ None
	• Management of nutritional-related	✓ None
	• diseases & disorders	
	• Processing meat, fish, and poultry products	✓ Processing, costing, and selling meat, poultry, and fish products and sausages
	• Importance of réchauffé and	✓ None
	• convenience foods in the diet	
	• Table setting and food service	✓ None

Source: NFT Syllabus

African Journal of Education and Practice
ISSN 2519-0296 (Online)
Vol.10, Issue 5, No.5, pp 78 - 96, 2024

www.iprjb.org

Planning, Development and Conclusion of Projects in NFT

Planning for Projects in NFT

Study findings in Table 2 show that projects are mostly done after teaching relevant subject content (Mean = 2.72; SD = 0.58). The qualitative findings also demonstrate that all content was first taught through other teaching methods. Afterward, learners identify community problems that could be solved using that content. They were then tasked to design and implement projects to address these problems. For instance, one learner explicitly stated that;

> We studied several topics and looked at what community problem we would solve using the knowledge. In the spices group, we first studied the processing and preservation of vegetables. So, I made spices to process and preserve vegetables with value addition (School B, Std FGD).

Similarly, a teacher during the KI interview also noted that;

> We guide them that these are topics we have covered, we want you to come up with projects depending on what we have covered so far but we want you to identify possible solutions. They then come up with problems and say we want to solve them like this, we keep dialoguing with them until they come up with something. We ask them questions like what is this problem you want to solve? What is this? Do you think this is the best project you can do to solve this problem? Don't you think there are other alternative things you can do? Some come up with something and you tell them this is very ordinary, the other time they did this, these people have also done this, there is nothing new, you are duplicating, think of something not yet done not duplicating. Being original and creative is moreover part of the project work score guide we received from the NCDC (School A, Teacher KI).

This means that much as from the literature, the best project-based learning practice would be avoiding pre-teaching important content so that learners acquire it through the project, schools instead teach the content first and the projects are just used to test the application of content already learned using other methods. However, their focus on solving community problems is commendable because it enables learners to engage in authentic projects that deal with a real-world context, creating a targeted approach to solving community problems within the context of the Nutrition and Food Technology syllabus suggesting a strong integration of issues present within the community into the learning process. By addressing community issues that directly relate to the content taught in NFT, it bridges the gap between theoretical knowledge and its practical applications. Furthermore, the feedback the teacher gave does not help the learner because the questions given are just threatening a learner as if he or she has done trash. It should have been guidance on what aspects to improve on the project to allow learners to proceed with modifications.

The majority of the projects are conceptualized by learners and verbally shared with their teachers for example (76.4%) of the projects had no written proposals (Mean = 1.47; SD = 0.85). Qualitative findings collaborate with these quantitative findings. For example, one of the learners recounted that;

> No, when I saw how to make the product, I saw it was simple whereby I had all the materials and everything was in 'my head' and actually there was no need for writing. So, we verbally shared our ideas with the teacher and my group members. She asked for a sketch of the product which I made and shared with her. We then proceeded to make our product and wrote everything we had done in a report (School C, Std FGD).

Similarly, a teacher from another school also said;

> Through theory lessons, they get an insight of what problems exist in society. They shared their ideas with me without necessarily in writing because we are chasing syllabus coverage. What we want are products (School B, Teacher KI).

The majority of the NFT projects created by learners lack reference documentation to guide the project. This makes the implementation process unsystematic and more of trial and error. Though the trial and error may have a benefit of generating many lessons as they look at the project from different angles.

In summary, planning projects in NFT entails teaching relevant content before learners conceptualize projects that apply the content to solve community problems. It is rare for learners to write proposals; instead, they share them verbally only with their teachers for guidance.

Development of Projects in NFT

As learners develop the projects, they always utilize all the materials planned for to avoid wastage (Mean = 2.97; SD = 0.20) and apply some 21st-century skills that include creativity (Mean = 2.65; SD = 0.61), cooperation (Mean = 2.61; SD = 0.63), critical thinking (Mean = 2.71; SD = 0.54), and communication (Mean = 2.61; SD = 0.62) with less focus on the expression of calculation skills (Mean = 1.67; SD = 0.79). Details of the projects' development phase are presented in Table 4.3

Qualitative findings agree with quantitative findings on low utilization of calculation skills but disagree on critical thinking for example a learner in one of the schools narrated;

> While doing our projects, we ensure every resource planned for is used to avoid loss of marks. Also, we always work and discuss in groups to generate project ideas. For our group, we saw tomato sauce was expensive and there was a time when it was cheap, and at the same time, tomatoes are very many and rotting. So, we discussed and agreed to make tomato sauce. The challenge we have is some group members want to dominate because our teacher looks at how active one is in a group to get marks (School D, Std FGD).

In addition, a teacher from another school also said;

> Based on the guidance on how to mark project work we have been given by NCDC, I ensure my learners work together and make presentations to the whole class as they progress with the project. Also, I ensure that learners utilize all the resources planned for because these projects are expensive for example the learners of the matooke [banana] powder project, we gave them a batch but the powder they got could not even feed someone to satisfaction. So, they asked for more four batches which we have given but still, the powder is little. They even keep asking for soya and 'Mukene' [dried silver fish] to add to the powder. So, since it was for learning, we left it at that. By the way, any wastage angers our administrators and you may not get more funding for the next projects (School H, Teacher KI).

From the quantitative and qualitative data, project development phase considers a narrow scope of 21st-century skills leaving other important skills including understanding calculations. The fact that they not paying attention on calculations, they don't pay attention to asking for sufficient amounts to complete the project. The concept of resource utilization is often misconstrued. Learners are not thinking critically and for that matter they can't tease out what they need to do the project leading to haphazard requisitions for example asking for soya and

Mukene at the tail end of the project and for that matter this puzzled the teacher. However, the teacher did not need to get puzzled because these were learners doing projects for the first time.

Project Conclusion in NFT

Findings in Table 2 show that conclusion of projects in NFT always focus on the final product particularly its originality (Mean = 2.53; SD = 0.82), creativity (Mean = 2.72; SD = 0.71), accuracy (Mean = 2.68; SD = 0.75), testing of the product (Mean = 2.61; SD = 0.63) and ensuring the product can potentially solve the community problem (Mean = 2.65; SD = 0.61). It also involves writing a relevant (Mean = 2.50; SD = 0.76), accurate (Mean = 2.69; SD = 0.76), coherent (Mean = 2.77; SD = 0.74) and excellent (Mean = 2.68; SD = 0.69) report.

This is corroborated by qualitative findings for example a teacher in one of the schools stated that;

> Learners ensure that their products are original and creatively made, and they solve the community problem to surely score highly on these projects. I don't allow duplication of projects for example some of my learners made fruit books, carrot cookies, and spaghetti rich in fibre not found on the market so far. So, for each project, I continuously ask learners to tell me the new thing in their work. Even when they pick a recipe from the internet or anywhere else, they must modify it before using it based on the information they have learned (School C, Teacher KI).

Relatedly, a learner in one of the schools said that;

> We finish our projects by handing in the product and the report. We ensure that we produce products that have never existed for example in our group we made soy fish powder and peanut butter daddies because they are not anywhere on the market and yet these products enhance protein content. When we presented our report to the teacher, she said she marked based on the relevance, coherence, and accuracy of the work (School A, Std FGD)

Although the quantitative and qualitative findings emphasize originality of products and hence learners create products that have never existed on market, when these innovative products are not yet available in the market, they must undergo sensory evaluation and obtain approval from the Uganda National Bureau of Standards (UNBS). Merely conceptualizing solutions on paper and developing products that remain confined within the schools does not address community challenges effectively. It is essential to establish a connection between students and industries to bridge this gap.

African Journal of Education and Practice
ISSN 2519-0296 (Online)
Vol.10, Issue 5, No.5, pp 78 - 96, 2024

www.iprjb.org

Table 2: Planning, Development and Conclusion Projects in NFT

	Features	Details	N	Always	Sometimes	Never	Mean	SD
Planning projects in NFT	Timing of the project	Project done after relevant subject content is taught	197	94.4	4.6	1.0	2.97	0.20
	The project addresses a community problem	Project aimed at solving a community problem	197	78.1	15.5	6.4	2.72	0.58
	Proposal development	Presence of a written project proposal	197	23.6	0	76.4	1.47	0.85
		Project aligned to the theme	197	46.8	35.9	17.3	2.30	0.75
		Project justification made	197	22.7	34.1	43.2	1.8	0.79
		Project methodology written	197	24.6	0	75.4	1.48	0.85
		Project materials identified and budget made	197	0.9	1.8	97.3	1.04	0.23
	Mean						**1.62**	**0.69**
Development of projects	Resource utilization	Resources planned for are utilized to avoid wastage	197	94.4	4.6	1.0	2.97	0.20
	Utilization of 21st-century skills	Creativity	197	72.7	20.0	7.3	2.65	0.61
		Critical thinking	197	76.4	19.1	4.5	2.71	0.54
		Communication	197	68.2	24.5	7.3	2.61	0.62
		Expression of calculation skills	197	20.1	26.9	53.0	1.67	0.79
		Cooperation	197	68.6	23.6	7.7	2.61	0.63
	Mean						**2.45**	**0.64**
Conclusion of projects	Product finalization	Originality	197	40.9	31.4	27.7	2.53	0.82
		Creativity	197	55.0	32.3	12.7	2.72	0.71
		Accuracy	197	54.5	29.1	16.4	2.68	0.75
		Testing the product	197	68.6	23.6	7.7	2.61	0.63
		Ensuring the product can solve the community problem	197	72.7	20.0	7.3	2.65	0.61
	Mean						**2.64**	**0.70**
	Report	Relevant	197	47.7	34.1	18.2	2.50	0.76
		Accurate	197	45.9	36.8	17.3	2.69	0.74
		Coherent	197	39.1	28.6	32.3	2.77	0.82
		Excellent	197	49.5	38.6	11.8	2.68	0.69
	Mean						**2.66**	**0.75**

Key: A Mean of <2 Means Never; 2 Means Sometimes and 2 < Means Always

Source: Primary Data

Discussion

The study found out that in the NFT syllabus, projects are suggested for only food processing topics leaving 17 topics that emphasize the role of nutrition in health. While focusing on food processing is indeed essential, neglecting other nutrition-related subjects can limit students' comprehensive understanding of how various dietary components influence health outcomes. The implication of focusing solely on food processing topics is multifaceted. Firstly, it risks producing graduates who are proficient in the mechanics of food processing but lack a holistic view of nutrition. This narrow focus can hinder their ability to make informed decisions about making food products that promote health and prevent disease. Studies by (Kalache et al., 2019) and (Komolafe & Okafor, 2024) indicate that a comprehensive understanding of nutrition is crucial for future professionals in the field, especially in a world increasingly plagued by lifestyle-related illnesses, such as obesity and diabetes. It is possible to have projects in the topics that link nutrition to health for example, projects on topics of food nutrients could have allowed learners to experimentally explore diverse sources of different food nutrients, experiment with different cooking methods to ensure nutrient retention and develop creative and nutrient-dense meals (Peltola et al., 2020). They could take into consideration the bioavailability, different dietary preferences, cultural variations, and economic factors. Also, projects in the topic of "Nutrition and the Lifecycle," could address the diverse nutritional requirements associated with different life phases by involving learners in hands-on activities such as designing customized meal plans for specific life stages such as infancy, childhood, adolescence, adulthood, and elderly nutrition (Bernstein & McMahon, 2022) while covering fundamental principles of nutrition at different life stages, the importance of key nutrients, and practical strategies for meal planning (WHO, 2019) among others. This balanced practical approach would not only deepen their understanding of theoretical concepts but also equip learners with valuable skills in nutritional planning to address the complex health challenges of our time (Whitney et al., 2019).

More study findings from the study show that planning projects in NFT entails teaching relevant content before learners conceptualize projects that apply the content to solve community problems. (Almulla, 2020; Kanyesigye et al., 2023). This involves students in real-life applications of nutrition concepts, such as dietary planning, food safety practices, and nutrient analysis. This hands-on approach helps bridge the gap between theoretical knowledge and practical understanding, as students can immediately see the relevance of what they learn in the classroom to their daily lives and community needs. Engagement in these projects, students not only retain nutrition knowledge better but also develop a deeper connection with the subject matter, which is particularly valuable in Uganda, where nutrition and food security are critical public concerns.

Doing projects when the intended topic(s)' content and skills are taught using other methods is similar to the findings of previous researchers who reported that it was a challenge to use the project to learn the central content of the subject (Markula & Aksela, 2022). Whereas (Almulla, 2020) supports the notion that such prior knowledge enhances project relevance and effectiveness and equips learners with the necessary knowledge first before the project, this is not considered PBL (Thomas, 2000) where learners are expected to learn such content and skills as they do the project (BIE, 2019; Thomas, 2000). This allows integral acquisition and application of knowledge as sustains motivation to search for more new knowledge and skills throughout the project resulting into deeper learning (Krajcik & Czerniak, 2013; Nyström et al., 2018; Thomas, 2000). So, much as the norm in NFT in Uganda is for learners to do projects

when the central content of the subject is taught (NCDC, 2019; UNEB, 2024), such guidance should be reversed to focus on what the learners can research and find out rather than what they can create or do using already learned content (Markula & Aksela, 2022). Furthermore, having projects designed to address real community issues is a good practice because it ensures that learners engage in authentic tasks (Grant, 2002; Hasni et al., 2016; Krajcik & Namsoo, 2014; Thomas, 2000). This not only makes learning relevant but also encourages learners to contribute positively to their communities (Molderez & Fonseca, 2018; Ryan et al., 2018).

In addition, the study revealed that during the planning of projects, it is rare for learners to write proposals; instead, they share them verbally only with their teachers for guidance. The observation that learners typically share their proposals verbally with their teachers rather than writing them down presents both challenges and opportunities. Much as learners may not be writing proposals because of their limited capacity to engage in academic Writing (Maharani et al., 2022), the reliance on verbal communication for proposal sharing may limit students' ability to visibly, systematically and comprehensively articulate their thoughts (Morrison et al., 2019; Schweiger, 2023). This is because written proposals often require a structured format that encourages critical thinking and detailed planning (Ennis, 2018). Such a structured approach can enhance clarity of thought and communication skills, which are essential in both academic and professional contexts. Furthermore, written proposals allow for a tangible reference that students and teachers can revisit, facilitating ongoing feedback and revision (Carless & Boud, 2018). In contrast, verbal discussions may lack the permanence needed for reflection and iterative improvement.

Additionally, the absence of written proposals may indicate a gap in teaching methodologies that promote comprehensive project management skills. According to a study by (Karen E Aspry et al., 2018), the ability to write proposals is a critical skill for any professional in the nutrition and food industry. When this skill is not prioritized, educators may inadvertently limit students' preparedness for future endeavors, whether in higher education or in the workforce. Developing strong proposal writing skills can empower students to advocate for their projects and secure funding or support from various stakeholders, thereby increasing the likelihood of successful project implementation.

On a positive note, verbal proposal sharing can foster immediate feedback from teachers, allowing for rapid refinement of ideas. Research by (Tan & Chen, 2022) indicates that this dynamic interaction can enhance learners' understanding and encourage collaborative learning. Furthermore, it creates a supportive environment where students can express their thoughts without the pressure of formal writing. This is particularly beneficial for learners who may struggle with writing but possess strong verbal communication skills.

However, educators should consider integrating both verbal and written components into the project planning process. Encouraging students to develop written proposals, alongside opportunities for verbal discussion, can create a more robust learning experience. This dual approach would not only enhance students' written communication skills but also promote critical thinking, as they would need to carefully consider their ideas and arguments before presenting them. Research by (Peng & Chen, 2019) supports this integrated approach, suggesting that combining different forms of communication can enhance overall learning outcomes.

Also, during the study, it was found that during project development, learners focus on a narrow scope of 21st-century skills that include creativity, collaboration, critical thinking, and communication leaving other important skills including understanding facts, figures, and

statistics. While creativity, collaboration, critical thinking, and communication are vital, they must be grounded in mathematical skills specific to nutrition and food technology (Goldsmith et al., 2021). The NFT subject is a scientific field, and learners need to develop the skills to critically evaluate and use scientific data (Namoun & Alshanqiti, 2020). This competency allows students to analyze data effectively, interpret research findings, and make informed decisions based on evidence without which, learners may struggle to evaluate the nutritional quality of food products, assess dietary patterns, or understand the impact of nutrition on public health (Drummond et al., 2022), For instance, a project focused on promoting healthier eating habits in a community requires an understanding of local dietary statistics to tailor interventions appropriately. Students must be able to access, interpret, and apply quantitative data to justify their project proposals and evaluate their effectiveness. So, neglecting this aspect can hinder their ability to engage with the latest research, apply evidence-based practices, and contribute to advancing nutritional science as is in real-world NFT careers (K E Aspry et al., 2018). Therefore, while other 21st-century skills are valuable, a well-rounded education in Nutrition and Food Technology should prioritize the development of learners' mathematical skills tailored to the subject.

More findings from the study show that during the development of NFT projects, the originality of the products is emphasized but there is the use of generic score guidelines to assess students' projects in NFT which learners were not aware of before marking. The emphasis on originality in projects within the Nutrition and Food Technology (NFT) curriculum is crucial for fostering student creativity and innovation. Originality encourages learners to develop unique solutions and approaches to nutritional challenges, ultimately contributing to their growth as independent thinkers and problem solvers (Chacon & Janssen, 2021).

Using generic standardized assessment guidelines (NCDC, 2019; UNEB, 2024) is a double-edged sword. On one hand, it can help ensure some level of consistency and fairness in assessments (Suskie, 2018). However, one of the primary drawbacks of standardized guidelines is their inherent lack of flexibility (Margot & Kettler, 2019). Consequently, the educational experience becomes a checklist of tasks rather than a rich, meaningful learning journey. This focus on assessment stifles creativity and innovation among students because learners are driven by the need to achieve specific grades and hesitate to take risk or explore unconventional ideas. Since, NFT projects are often diverse and take various forms, addressing different nutrition-related issues (Tumilowicz et al., 2019), the standard assessment guidelines may not accommodate the full spectrum of innovative projects that deviate from the standard template. For instance, in the assessment of post-harvest handling equipment; relevance to food preservation, efficiency, and safety, integration of technology, ease of use, and maintenance are key while assessing nutrition education materials, the focus can be on scientific accuracy, clarity, and pedagogy, alignment with curriculum, and cultural sensitivity. When assessing sanitation and environmental hygiene materials, one would consider food safety focus, environmental impact, and regulatory compliance. To assess skin care products, one would focus on nutritional relevance, ingredient analysis, safety and allergens. These aspects should be evaluated in addition to the already existing guidelines so that alignment of the projects to the subject is established through ascertaining the nutritional implications of the projects on the communities or individuals. Furthermore, in the pursuit of consistency, standardized guidelines can inadvertently stifle creativity and innovation (Margot & Kettler, 2019). So, learners may feel constrained to conform to a predefined model, potentially discouraging them from exploring unique approaches or solutions to nutrition challenges.

Overall, findings from the study show that, there is an overemphasis on doing projects for assessment instead of learning. This could be stemming from educational guidelines prioritizing assessment outcomes over the pedagogical value of project-based learning (PBL) (NCDC, 2019; UNEB, 2024). When projects are viewed as mere assessments or tests after traditional teaching, the intrinsic motivation to explore and discover concepts independent of the teacher may be diminished (Conradty et al., 2020) since students may prioritize completing tasks for grades rather than engaging deeply with the material (McTighe et al., 2020).

CONCLUSION AND RECOMMENDATIONS

Conclusion

The study has revealed that project-based learning of NFT in secondary schools in Kampala involved doing projects to provide additional practice or practical applications for material taught initially by other means. Learners kept their project ideas in their heads and shared them with only their teachers as they worked on their products. Finally, they write project reports to document the whole process. The findings highlight the need to reform the utilization of project-based learning in NFT from using it as an application of already taught content but rather an avenue through which new content is learned.

Recommendations

Nutrition and Food Technology (NFT) teachers should use PBL as the central teaching method. So, much as the current guidance on project-based learning in NFT in Uganda is for learners to do projects after a topic has been taught, such guidance should be reconsidered by the National Curriculum Development Centre.

Also, the National Curriculum Development Centre should explore the possibility of reviewing the current NFT syllabus to include projects in topics on nutrition and health.

This study was only carried out in Kampala and hence limited in geographical scope, a replication of the study in the whole country is recommended. Even though the findings show that assessment does not significantly contribute to the enhancement of nutrition knowledge, further studies on assessment for learning in PBL are recommended as assessment is central to the learning process.

Limitation of the Study

This study was only carried out in Kampala and hence limited in geographical scope, a replication of the study in the whole country is recommended.

Ethical Considerations

The study was cleared by the research and higher degrees' committee of the School of Education, Makerere University. Teachers of NFT were asked to sign a written consent before participating in the key informant interviews following an explanation by the researcher. Likewise, teachers were asked to give oral assent for their learners before enrolling them into the study. The responses of the focus groups and key informant interviews were recorded after getting the consent of the respondents. Written and recorded responses were safely stored, and only accessible to the research team. Furthermore, participants had a chance to withdraw from the study if they felt uncomfortable to continue. Respondents were not asked for identifiable personal information and their responses were anonymized at the point of data presentation, analysis, and interpretation.

REFERENCES

Abdulwahab, A. N. (2018). Nutritional Knowledge among High School Male Students in Kuwait. *Journal of Community Medicine & Health education journal*, *8*(5). https://doi.org/10.4172/2161-0711.1000627

Almulla, M. A. (2020). The effectiveness of the project-based learning (PBL) approach as a way to engage students in learning. *Sage Open*, *10*(3), 2158244020938702.

Aspry, K. E., Horn, L. V., Carson, J. A. S., Wylie-Rosett, J., Kushner, R. F., Lichtenstein, A. H., Devries, S., Freeman, A. M., Crawford, A., & Kris-Etherton, P. (2018). Medical nutrition education, training, and competencies to advance guideline-based diet counseling by physicians. *A science advisory from the American Heart Association. Circulation*, *137*(23), e821-e841. https://doi.org/10.1161/CIR.0000000000000563

Aspry, K. E., Van Horn, L., Carson, J. A. S., Wylie-Rosett, J., Kushner, R. F., Lichtenstein, A. H., Devries, S., Freeman, A. M., Crawford, A., & Kris-Etherton, P. (2018). Medical nutrition education, training, and competencies to advance guideline-based diet counseling by physicians: a science advisory from the American Heart Association. *Circulation*, *137*(23), e821-e841.

Ateya, E. S. M., Fouad, N. A., El-Wahid, H. A. A., & Younes, M. M. (2016). Knowledge Attitude and Reported Practices toward Optimal Nutrition among Preparatory School Learners. *Port Said Scientific Journal of Nursing*, *3*(2).

Badrasawi, M., Anabatawi, O., & Qaissieh, M. (2021). Nutrition knowledge and dietary practices among secondary school students in HebronPalestine: a cross-sectional study. *Palestinian Medical and Pharmaceutical Journal (PMPJ), 6(1): 00-00. https://staff.najah.edu/media/published_research/2020/10/23/Nutrition_knowledge_and_dietary_practices_among_secondary_school_students_in_Hebron-_Palestine_a_cross-sectional_study.pdf*.

Bernstein, M., & McMahon, K. (2022). *Nutrition across life stages*. Jones & Bartlett Learning.

BIE. (2019). Gold Standard PBL: Project Based Teaching Practices. *https://my.pblworks.org/system/files/documents/Gold_Standard_PBL_Teaching_v2019.pdf*.

Carless, D., & Boud, D. (2018). The development of student feedback literacy: enabling uptake of feedback. *Assessment & Evaluation in Higher Education*, *43*(8), 1315-1325.

Chacon, J. A., & Janssen, H. (2021). Teaching critical thinking and problem-solving skills to healthcare professionals. *Medical Science Educator*, *31*(1), 235-239.

Conradty, C., Sotiriou, S. A., & Bogner, F. X. (2020). How creativity in STEAM modules intervenes with self-efficacy and motivation. *Education Sciences*, *10*(3), 70. https://doi.org/https://doi.org/10.3390/educsci10030070

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2019). Implications for educational practice of the science of learning and development. *Applied Developmental Science*, *24*(2), 97–140. https://doi.org/https://doi.org/10.1080/10888691.2018.1537791

Dia, O. E. W., Løvhaug, A. L., Rukundo, P. M., Torheim, L. E., & (2021). Mapping of outdoor food and beverage advertising around primary and secondary schools in Kampala city, Uganda. *BMC Public Health, 21:707.* . https://doi.org/https://doi.org/10.1186/s12889-021-10661-8

Drummond, K. E., Reyes, A., Goodell, L. S., Cooke, N. K., & Stage, V. C. (2022). Nutrition research: Concepts and applications.

Ennis, R. H. (2018). Critical thinking across the curriculum: A vision. *Topoi*, *37*, 165-184.

Goldsmith, J., Sun, Y., Fried, L., Wing, J., Miller, G. W., & Berhane, K. (2021). The emergence and future of public health data science. *Public Health Reviews*, *42*(1604023). https://doi.org/10.3389/phrs.2021.1604023

GoU. (2011). *Uganda Nutrition Action Plan 1, 2011-2016. Scaling Up Multi-Sectoral Efforts to Establish a Strong Nutrition Foundation for Uganda's Development*. (https://www.health.go.ug/docs/UNAP_11_16.pdf).

GoU. (2013). *Ministry of Education and Sports: Guidelines on school feeding and nutrition intervention programme for use in universal primary education (UPE) and Universal post primary Education and Training (UPPET) school systems. Kampala, Uganda*. https://doi.org/From https://docplayer.net/42811408-Guidelines-on-school-feeding-and-nutrition-intervention-programme.html

GoU. (2020). *The Uganda Nutrition Action Plan (UNAP) II, 2020 –2025*. Kampala

Grant, M. M. (2002). Getting a grip on project-based learning: Theory, cases and recommendations. *Meridian*, *5*, 1-17. https://doi.org/https://www.researchgate.net/publication/228908690_Getting_a_grip_on_project-based_learning_Theory_cases_and_recommendations

Hasni, A., Bousadra, F., Belletête, V., Benabdallah, A., Nicole, M., & Dumais, N. (2016). Trends in research on project-based science and technology teaching and learning at K–12 levels: a systematic review. *Studies in Science Education, , 52:2*, 199-231. https://doi.org/10.1080/03057267.2016.1226573

Kalache, A., De Hoogh, A., Howlett, S., Kennedy, B., Eggersdorfer, M., Marsman, D. S., Shao, A., & Griffiths, J. (2019). Nutrition interventions for healthy ageing across the lifespan: a conference report. *European journal of nutrition*, *58*, 1-11.

Kanyesigye, S. T., Uwamahoro, J., & Kemeza, I. (2023). Effect of problem-based learning on Ugandan secondary school physics classroom practices: an observational study. *F1000Research*, *12*, 245.

Komolafe, F. O., & Okafor, N. A. (2024). Prevention and Self-Care Practices for Lifestyle Diseases Among Civil Servants in Nigeria. *International Journal of Public Health, Pharmacy and Pharmacology*, *9*(1), 49-64.

Krajcik, J., & Namsoo, S. (2014). *Project-based learning*. The Cambridge Handbook of the Learning Sciences, 2nd Edition, 275 – 297. https://doi.org/10.1017/CBO9781139519526.018

Krajcik, J. S., & Czerniak, C. M. (2013). *Teaching science in elementary and middle school classrooms: A project-based approach* (4th ed.). Taylor and Francis. https://doi.org/https://doi.org/10.4324/9780203113660

Kusemererwa, D. O. (2021). Nutritional awareness among secondary schools students in Maganjo – Wakiso district. In *A project report submitted to the department of food science and technology in partial fulfillment of the requirement for an award of a degree in bachelor of science in human nutrition*. Makerere University library. https://doi.org/https://www.researchgate.net/publication/352372196_NUTRITION_NUTRITIONAL_AWARENESS_AMONG_SECONDARY_SCHOOLS_STUDENTS_IN_MAGANJO

Kyomuhangi, P., Tamare, A., & Atuheire, C. G. K. (2022). Nutritional knowledge, attitude and practices of adolescents towards healthy eating in secondary schools in Sheema municipality, Sheema district, Uganda. *IAA Journal of Scientific Research 9*(1), 34-51. https://doi.org/https://www.iaajournals.org/wp-content/uploads/2022/12/IAA-JSR-9134-51-2022.-KIUP79.pdf

Lobstein, T., Jackson-Leach, R., Moodie, M. L., Hall, K. D., Gortmaker, S. L., Swinburn, B. A., & Wang, Y. (2015). Child and adolescent obesity: part of a bigger picture. *Lancet, 385(9986): 2510–2520.* . https://doi.org/10.1016/S0140-6736(14)61746-3

Maharani, D. P., Rukmini, D., Faridi, A., & Astuti, P. (2022). Students' Academic Writing Competence Realized in Writing Research Proposals: Viewed from their Content, Organization and Cohesion, Range, Register, and the Accuracy of Language. *Journal of Research & Method in Education* https://doi.org/10.9790/7388-1101023643

Mamba, N. P. S., Napoles, L., & Mwaka, N. M. (2018). Nutrition knowledge, attitudes and practices of primary school children in Tshwane Metropole. *African Journal of Primary Health & Family Medicine, 11(1), a1846.* https://doi.org/https://doi.org/10.4102/phcfm.v11i1.1846

Margot, K. C., & Kettler, T. (2019). Teachers' perception of STEM integration and education: a systematic literature review. *International Journal of STEM education*, *6*(1), 1-16. https://doi.org/https://doi.org/10.1186/s40594-018-0151-2

Markula, A., & Aksela, M. (2022). The key characteristics of project-based learning: how teachers implement projects in K-12 science education. *Discip Interdscip Sci Educ Res*, *4*, 2. https://doi.org/ https://doi.org/10.1186/s43031-021-00042-x

McTighe, J., Doubet, K. J., & Carbaugh, E. M. (2020). *Designing authentic performance tasks and projects: Tools for meaningful learning and assessment*. ASCD.

MOH. (2024). *DIETARY ASSESSMENT OF SECONDARY SCHOOL LEARNERS IN AND AROUND KAMPALA,UGANDA JUNE 2024* Ministry of Health

Molderez, I., & Fonseca, E. (2018). The efficacy of real-world experiences and service learning for fostering competences for sustainable development in higher education. *Journal of cleaner production*, *172*, 4397-4410. https://doi.org/https://doi.org/10.1016/j.jclepro.2017.04.062

Morrison, G. R., Ross, S. J., Morrison, J. R., & Kalman, H. K. (2019). *Designing effective instruction*. John Wiley & Sons.

Naigaga, D. A., Pettersen, K. S., Henjum, S., & Guttersrud, Ø. (2018). Assessing adolescents' perceived proficiency in critically evaluating nutrition information. *International Journal of Behavioral Nutrition and Physical Activity, 15:61.* . https://doi.org/https://doi.org/10.1186/s12966-018-0690-4

Namoun, A., & Alshanqiti, A. (2020). Predicting student performance using data mining and learning analytics techniques: A systematic literature review. *Applied Sciences*, *11*(1), 237. https://doi.org/ https://doi.org/10.3390/app11010237

NCDC. (2010). *Integrated production skills (IPS). Food and Nutrition Syllabus*. Kampala Uganda

NCDC. (2019). *Lower secondary curriculum. Nutrition and Food Technology Syllabus* NCDC.

NCDC. (2021). *Guidelines on School-based assessment for the revised lower secondary curriculum*.

Ndahura, B. N. (2012). *Nutrition literacy status of adolescent learners in Kampala district, Uganda. Master thesis of the faculty of Health Sciences, Oslo and Akershus University College of Applied Sciences*. https://doi.org/ https://www.researchgate.net/publication/277257241

Nyström, M. E., Karltun, J., Keller, C., & Gäre, B. A. (2018). Collaborative and partnership research for improvement of health and social services: researcher's experiences from 20 projects. . *Health research policy and systems*, *16*(1), 1-17. https://doi.org/https://doi.org/10.1186/s12961-018-0322-0

Okeyo, A. P., Seekoe, E., Villiers, A. d., Faber, M., Nel, J. H., & Steyn, N. P. (2020). The Food and Nutrition Environment at Secondary Schools in the Eastern Cape, South Africa as Reported by Learners. *International Journal of Environmental Research and Public Health, 5;17(11): 4038.* . https://doi.org/10.3390/ijerph17114038

Oti, J. A., & Amoah, A. N. (2019). Nutritional Knowledge and Food Consumption of Adolescent Students in Junior High Schools in a Rural Community in the Eastern Region of Ghana. *American Journal of Food and Nutrition*, *7*(2), 36-42. https://doi.org/10.12691/ajfn-7-2-1

Peltola, T., Kaljonen, M., & Kettunen, M. (2020). Embodied public experiments on sustainable eating: demonstrating alternative proteins in Finnish schools. *Sustainability: Science, Practice and Policy*, *16*(1), 184-196.

Peng, M. Y.-P., & Chen, C. C. (2019). The Effect of Instructor's Learning Modes on Deep Approach to Student Learning and Learning Outcomes. *Educational Sciences: Theory and Practice*, *19*(3), 65-85.

Ryan, S., Adamson, N., Aktipis, A., Andersen, L., Austin, R., Barnes, L., Beasley, M., Bedell, K., Briggs, S., & Chapman, B. (2018). The role of citizen science in addressing grand challenges in food and agriculture research. *Proceedings of the Royal Society B*, *285*(1891), 20181977. https://doi.org/https://doi.org/10.1098/rspb.2018.1977

Sarr, B., Fernandes, M., Banham, L., Bundy, D., Gillespie, A., McMahon, B., Peel, F., Tang, K. C., Tembon, A., & Drake, L. (2017). The Evolution of School Health and Nutrition in the Education Sector 2000–2015 in sub-Saharan Africa. *Front. Public Health 4*, 271. https://doi.org/10.3389/fpubh.2016.00271

Schweiger, G. (2023). Can't We Do Better? A cost-benefit analysis of proposal writing in a competitive funding environment. *PloS one*, *18*(4), e0282320. https://doi.org/https://doi.org/10.1371/journal.pone.0282320

Shabani, K., Khatib, M., & EbadI, S. (2010). Vygotsky's Zone of Proximal Development: Instructional Implications and Teachers' Professional Development. *English language teaching*, *3*(4), 237-248. https://doi.org/https://files.eric.ed.gov/fulltext/EJ1081990.pdf

Suskie, L. (2018). *Assessing student learning: A common sense guide*. John Wiley & Sons.

Taber, K. S. (2020). Mediated Learning Leading Development—The Social Development Theory of Lev Vygotsky. In B. Akpan, & T. J. Kennedy (Eds.), Science Education in Theory and Practice *Springer*, 277-291. https://doi.org/https://doi.org/10.1007/978-3-030-43620-9_19

Talagala, I. A., & Arambepola, C. (2016). Use of food labels by adolescents to make healthier choices on snacks: a cross sectional study from Sri Lanka. *BioMed Central Public Health*, *16*, 739. https://doi.org/10.1186/s12889-016-3422-1

Tan, J. S., & Chen, W. (2022). Peer feedback to support collaborative knowledge improvement: What kind of feedback feed-forward? *Computers & Education*, *187*, 104467.

Thomas, J. W. (2000). A review of research on project-based learning. *http://www.bobpearlman.org/BestPractices/PBL_Research.pdf*.

Tumilowicz, A., Ruel, M. T., Pelto, G., Pelletier, D., Monterrosa, E. C., Lapping, K., Kraemer, K., Regil, L. M. D., Bergeron, G., & Arabi, M. (2019). Implementation science in nutrition: concepts and frameworks for an emerging field of science and practice. *Current developments in nutrition*, *3*(3), nzy080. https://doi.org/10.1093/cdn/nzy080

UNEB. (2024). Continuous assessment observation checklist for the project.

Vygotsky, L. S. (1978). *Mind and society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Whitney, E. N., Rolfes, S. R., Crowe, T., & Walsh, A. (2019). *Understanding nutrition*. Cengage AU.

WHO. (2019). *Essential nutrition actions: mainstreaming nutrition through the life-course*. Geneva: World Health Organization;. https://doi.org/https://iris.who.int/bitstream/handle/10665/326261/9789241515856-eng.pdf?sequence=1