

The Role of Nutrition Education in Physical Education Programs: Sports as one of the Sustainable Development Goals

Nashwan A. Nashwan * 

Department of Service Courses, Faculty of Arts, Isra University, Amman, Jordan

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* Corresponding author:
nashwan.nashwan@iu.edu.jo

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Abstract

Objectives: This study aimed to investigate the role of nutrition education within physical education programs and its impact on students' well-being while contributing to the Sustainable Development Goals (SDGs), particularly Goals 3, 5, 11, 16, and 17.

Methods: A mixed-methods approach was adopted, integrating quantitative and qualitative methodologies. The sample included 350 male and female students from seventh to tenth grades and 50 sports teachers from government schools in Irbid Governorate.

Results: The findings revealed a strong connection between sports and sustainable development within the educational framework. The study emphasized the importance of sustainable food systems in preserving the environment, enhancing food security, and reducing food waste. It also highlighted the need to educate and raise awareness among future generations to promote healthy, sustainable dietary practices.

Conclusions: The researcher recommends conducting workshops in schools to raise awareness of the significance of sports in achieving SDGs. Further research is encouraged to explore the correlation between sports and sustainable development.

Keywords: Nutrition Education, Physical Education Programs, Holistic Well-being, Health-Conscious Behaviors, Sustainable Development Goals.

دور التربية التغذوية في برامج التربية البدنية: الرياضة كأحد أهداف التنمية المستدامة

نشوان عبدالله نشوان *

قسم المساقات الخدمية، كلية الآداب، جامعة الإسراء، عمان، الأردن.

ملخص

هدف الدراسة: هدفت الدراسة إلى فهم الدور المتعدد الأوجه للتربية الغذائية في برامج التربية البدنية، وأثرها على رفاهية الطلاب، وتحقيق أهداف التنمية المستدامة السبعة عشر، وأهمها (الهدف 3، 5، 11، 16، 17).

المنهجية: لتحقيق أهداف الدراسة، اتبعت هذه الدراسة منهجاً مختلطاً يجمع بين المنهجين الكمي والنوعي لاستكشاف تكامل التربية الغذائية ضمن برامج التربية الرياضية بشكل شامل، وتألفت عينة الدراسة من 350 طالباً وطالبة من الصف السابع إلى العاشر الثانوي، و50 معلماً ومعلمة رياضية من المدارس الحكومية في محافظة إربد.

النتائج: توصلت الدراسة إلى أن الرياضة ترتبط ارتباطاً عضوياً بمتطلبات التنمية المستدامة التي يحتاجها المجتمع في إطار المنظومة التعليمية الشاملة، وأن نظام الغذاء المستخدم هو نظام يحافظ على البيئة، ويساهم في تعزيز الأمن الغذائي القادر على تلبية احتياجات كافة الناس، وتقليل هدر الغذاء للحفاظ على الصحة والبيئة، والعمل على تثقيف وتوعية الأجيال القادمة؛ لتمكينهم من اتباع نظام غذائي صحي ومستدام في المستقبل.

التوصيات: في ضوء النتائج التي تم الحصول عليها، يوصي الباحث بعقد ورش عمل في المدارس والتوعية بأهمية الرياضة ودورها في تحقيق أهداف التنمية المستدامة، وإجراء المزيد من الدراسات التي تبين الارتباط بين الرياضة وأهداف التنمية المستدامة.

الكلمات الدالة: التثقيف الغذائي، برامج التربية البدنية، الرفاهية الشاملة، السلوكيات الصحية الواعية، أهداف التنمية المستدامة.



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Introduction

After 15 years of unprecedented progress towards the Millennium Development Goals, the world has turned its attention to subsequent Sustainable Development Goals in a transition to the 2030 Agenda for Sustainable Development, adopted in 2015, aiming to bring people and planet closer together and leave no one behind. It represents a unique opportunity to inspire global action for development across the world, including in the field of sport for development and peace.

Sport has proven to be a cost-effective and flexible tool for promoting peace and development goals. Since the inception of the Millennium Development Goals in 2000, sport has played a vital role in multiple resolutions passed by the General Assembly. In Resolution 70/1, entitled "Transforming our world: the 2030 Agenda for Sustainable Development", adopted in 2015, the role of sport in promoting social progress continued to be recognized: "Sport is also an important enabler of sustainable development. We acknowledge the growing contribution that sport plays in achieving development and peace, given its role in encouraging tolerance and respect and its contribution to the empowerment of women, youth, individuals and communities and to achieving the desired goals in the areas of health, education and social integration".

In the pursuit of cultivating holistic well-being among students, the intersection of nutrition education and physical education programs plays a pivotal role. This research seeks to delve into "The Role of Nutrition Education in Physical Education Programs," examining the nuanced dynamics that contribute to the overall health and development of students. The significance of this study lies not only in its theoretical exploration but also in the amalgamation of quantitative and qualitative data, engaging participants actively in the process.

As the contemporary educational landscape evolves, the integration of nutrition education within physical education programs has become a subject of considerable interest and debate. To contextualize the discussion, this research draws upon a rich body of literature. Prelip et al. (2006) explore the multifaceted role of classroom teachers in nutrition and physical education, highlighting the interconnectedness of these domains.

Wallen and Davis (2010) question the necessity of incorporating nutrition education into physical education, initiating a discourse that underscores the potential synergies between the two disciplines.

Brownell and Kaye (1982) offer insights into a school-based program that incorporates behavior modification, nutrition education, and physical activity, focusing on its impact on obese children. Schaub and Marian (2011) draw attention to the broader issue of America's educational system, emphasizing the need for improved nutrition and physical education. The foundational principles of physical education, fitness, and sport, as outlined by Siedentop and Van der Mars (2022), provide a comprehensive backdrop for understanding the broader context in which nutrition education is embedded.

Metos, Sarnoff, and Jordan (2019) contribute by investigating teachers' perceived and desired roles in nutrition education, shedding light on the educators' perspectives within this framework. Lee et al. (2007) present findings from the School Health Policies and Programs Study 2006, providing empirical evidence on the current state of physical education and physical activity in schools. Pangrazi and Beighle (2019) advocate for dynamic physical education for elementary school children, offering practical insights into fostering an active lifestyle from an early age.

Gallahue and Donnelly (2007) and Pérez-Rodrigo and Aranceta (2001) further contribute to the discourse by emphasizing developmental physical education for all children and sharing lessons learned from school-based nutrition education, respectively. The comprehensive work by Kohl III and Cook (2013) in "Educating the Student Body" broadens our understanding of the role of physical activity and physical education within the school system.

Meiklejohn, Ryan, and Palermo's (2016) systematic review explores the impact of multi-strategy nutrition education programs on the health and nutrition of adolescents, offering a contemporary perspective. Contento's (2008) review of nutrition education research in the *Journal of Nutrition Education and Behavior*, spanning from 1998 to 2007, provides a reflective analysis of the evolution of research in this domain.

By synthesizing and critically analyzing these diverse perspectives, this research aims to contribute authentic results and findings that inform the successful implementation of nutrition education within physical education programs. As we delve into the methodologies and outcomes, the active participation of the study's participants will serve as a cornerstone, ensuring that the research reflects the realities and experiences of those directly impacted by the integration of nutrition education in physical education programs.

Study Problem

Sport contributes to safety regardless of age, gender or ethnicity. It is an activity that everyone can enjoy, and is consistent with some of the Sustainable Development Goals, especially with regard to health (Goal 3): ensuring healthy lives and safety for all at all ages. Individuals benefit greatly from physical activity combined with a school curriculum, which is consistent with (Goal 4: Inclusive, quality and equitable education for all and the promotion of lifelong learning opportunities for all) (Bayoumi, 2023).

Sports are also capable of achieving (Goal 5: Achieving gender equality and empowering all women and girls) (Jarar, 2023). Through sport and physical activity, women and girls can be empowered and can benefit from the positive impact of sport on health and psychosocial conditions (Alla, 2020; Global Campaign for Peace education, 2020).

Sport also contributes to achieving (Goal 11: Make cities inclusive, safe, resilient and sustainable). Sport can also be used as a useful tool to prevent conflict and work to achieve long-lasting peace, because sport and its universality have the ability to transcend cultural boundaries, which is consistent with (Goal 16: Encouraging the establishment of just and peaceful societies in which no one is marginalized). And later achieving (Goal 17: Revitalizing the global partnership for sustainable development).

Based on the importance of sport previously mentioned, and its ability to achieve a number of sustainable development goals, this study comes to investigate the role of Nutrition Education in Physical Education Programs.

Objectives

The overarching goal of this research is to comprehensively investigate and understand the multifaceted role of nutrition education within physical education programs and its impact on the well-being of students. As the educational landscape continues to evolve, there is a growing need to unravel the complex interplay between these two domains. The study aims to provide valuable insights for educators, policymakers, and stakeholders, fostering evidence-based strategies that contribute to the holistic development of students.

- **Examine Current Practices:** Evaluate existing nutrition education and physical education programs in schools to discern the extent of integration, identifying prevailing practices, challenges, and successes.
- **Assess Educator Perspectives:** Investigate the perceptions and attitudes of educators towards the incorporation of nutrition education within physical education, exploring the facilitators and barriers they encounter.
- **Analyze Student Experiences:** Explore the experiences of students in programs where nutrition education is integrated into physical education, assessing the impact on their knowledge, attitudes, and behaviors regarding nutrition and physical activity.
- **Quantify Program Effectiveness:** Utilize quantitative methods to measure the effectiveness of integrated nutrition and physical education programs, examining outcomes such as changes in student health, academic performance, and overall well-being.
- **Explore Best Practices:** Identify and document best practices in nutrition education within physical education, drawing from successful case studies and exemplary programs that have demonstrated positive outcomes.
- **Examine Policy Implications:** Investigate the policy landscape surrounding nutrition education and physical education at the institutional and governmental levels, analyzing the influence of policies on program implementation.
- **Engage Stakeholders:** Facilitate a participatory approach by involving key stakeholders, including educators, students, parents, and policymakers, in the research process to ensure diverse perspectives are considered.

This study aims to contribute to a nuanced understanding of the integration of nutrition education within physical education programs. By achieving these objectives, the research endeavors to offer evidence-based recommendations that can inform educational practices, enrich curricula, and ultimately enhance the overall health and well-being of students. Through a combination of quantitative and qualitative data, this study aspires to provide a holistic perspective that not only advances academic discourse but also offers practical insights for those actively involved in shaping the educational experiences of students.

Literature review

The integration of nutrition education within physical education programs is a multifaceted endeavor that holds the potential to significantly impact the overall health and well-being of students. This literature review seeks to synthesize key findings from relevant studies, providing a comprehensive overview of the existing body of knowledge on this intersection. By examining the perspectives of educators, the experiences of students, program effectiveness, and broader policy implications, this review aims to contribute valuable insights for educators, policymakers, and researchers invested in shaping the educational landscape.

Educators' Perceptions and Roles

The discourse on educators' perceptions and roles in the integration of nutrition and physical education gains depth through the contributions of Prelip et al. (2006), who underscore the pivotal role of classroom teachers in navigating the intersection of these two domains. Their research illuminates the interconnectedness of nutrition and physical education, positioning educators as central figures in shaping the holistic well-being of students. Prelip et al.'s work lays the foundation for understanding the symbiotic relationship between nutrition and physical education within the pedagogical realm.

Metos, Sarnoff, and Jordan (2019) further enrich this narrative by delving into educators' perceived and desired roles specifically in nutrition education. Their exploration provides nuanced insights into the challenges educators face and the facilitators that empower them in delivering effective nutrition education. By unraveling the complexities of educators' roles, Metos et al. contribute to a more comprehensive understanding of the factors that influence successful integration and shed light on potential areas for targeted support and professional development.

Trudeau and Shephard (2008) broaden the discussion by investigating the intricate relationship between physical education, school physical activity, and academic performance. Their work transcends the immediate roles of educators, expanding the purview to the broader implications of physical education programs on academic outcomes. Trudeau and Shephard's research prompts a reflection on the holistic impact of physical education, urging educators and policymakers to consider not only the immediate roles within the classroom but also the far-reaching effects on students' academic achievements.

In synthesizing the perspectives of Prelip et al., Metos et al., and Trudeau and Shephard, a comprehensive narrative emerges, encapsulating the multifaceted roles educators play in the integration of nutrition and physical education. Prelip et al. lay the groundwork by highlighting the centrality of classroom teachers, Metos et al. delve into the specifics of nutrition education, and Trudeau and Shephard extend the conversation to the broader impact on academic performance. Together, these works create a narrative that positions educators as key architects in shaping not only the physical well-being but also the academic success of their students.

The exploration of educators' perceptions and roles within the domains of nutrition and physical education, as presented by Prelip et al., Metos et al., and Trudeau and Shephard, offers a rich tapestry of insights. This multifaceted examination calls for a holistic understanding of educators' contributions, emphasizing the need for targeted support, professional development, and a broader acknowledgment of their pivotal roles in shaping the comprehensive well-being of students within the educational ecosystem.

Integration Challenges and Policy Landscape

The inquiry into the integration of nutrition education within physical education, as examined by Wallen and Davis (2010), initiates a critical discourse on the practicality and challenges associated with this convergence. Their work raises fundamental questions regarding the feasibility of seamlessly incorporating nutrition education into the fabric of physical education programs. This interrogation becomes a steppingstone for the broader conversation initiated by Schaub and Marian (2011), who delve into the overarching concern of America's underachievement in both school nutrition and physical education. Their exploration not only acknowledges the challenges but also underscores the urgency of addressing these shortcomings within the larger educational framework. Complementing these perspectives, Siedentop and Van der Mars (2022) contribute foundational principles that provide a nuanced understanding of the policy landscape enveloping nutrition education. Their

insights contextualize the integration challenges within the broader educational policies, paving the way for a comprehensive examination of the interplay between nutrition education initiatives and the overarching policy framework.

The discourse initiated by Wallen and Davis propels us into a realm where the intersection of nutrition and physical education is not merely a pedagogical consideration but a systemic challenge. As their questioning implies, the integration of nutrition education requires a delicate balance, addressing logistical hurdles and educational imperatives simultaneously. Schaub and Marian broaden the perspective, painting a poignant picture of the nation's educational landscape, highlighting deficiencies in both nutrition and physical education. This expansion reframes the discourse from a localized challenge to a systemic concern, emphasizing the need for a holistic approach to educational reform. In this intricate landscape, Siedentop and Van der Mars anchor the discussion by elucidating the foundational principles that underpin the broader policy landscape. Their work emphasizes the need to situate nutrition education initiatives within the larger policy context, recognizing that successful integration requires alignment with overarching educational objectives.

The challenges outlined by Wallen and Davis, when viewed through the lens of Schaub and Marian's broader critique, underscore the multifaceted nature of the issues at hand. Logistical barriers, resource constraints, and the need for comprehensive educational reform converge to create a complex tapestry that necessitates careful navigation. Siedentop and Van der Mars, by contributing foundational principles, offer a roadmap for policymakers and educators to navigate this intricate landscape. Their insights encourage a paradigm shift, urging stakeholders to view the integration of nutrition education not in isolation but as an integral component of broader educational policies.

The integration challenges outlined by Wallen and Davis, expanded upon by Schaub and Marian, and contextualized by Siedentop and Van der Mars, collectively underscore the imperative for a holistic approach to nutrition education integration. These scholars illuminate not only the hurdles but also the potential benefits, urging policymakers and educators to collaboratively address systemic deficiencies within the broader policy landscape. In doing so, they lay the groundwork for transformative initiatives that can propel education towards a more comprehensive and interconnected future.

Student Experiences and Program Effectiveness

The empirical landscape of student experiences within physical education programs comes into focus through the work of Lee et al. (2007), who contribute vital evidence from the School Health Policies and Programs Study in 2006. Their research offers a comprehensive snapshot of the prevailing state of physical education and activity in schools, providing insights into the factors influencing student experiences. By illuminating the current landscape, Lee et al. pave the way for a nuanced exploration of the challenges and potential improvements needed to enhance student engagement and well-being within physical education.

Brownell and Kaye (1982) augment this narrative by presenting findings from a targeted school-based program designed for obese children. Their study delves into the realm of behavior modification, nutrition education, and physical activity, offering a tangible illustration of the potential impact of multifaceted interventions on student health. By homing in on a specific demographic, Brownell and Kaye provide valuable insights into the tailored approaches that can be effective in addressing unique student needs, emphasizing the significance of holistic interventions that extend beyond traditional educational paradigms.

In advocating for dynamic physical education tailored for elementary school children, Pangrazi and Beighle (2019) bring attention to the formative years of a child's educational journey. Their work underscores the importance of instilling habits of an active lifestyle from an early age, recognizing that the foundations of health-conscious behavior are laid in the developmental years. By emphasizing dynamism in physical education, Pangrazi and Beighle contribute to the discourse on program effectiveness, urging educators and policymakers to consider innovative approaches that resonate with the unique needs and energy levels of young students.

Lee et al.'s empirical insights, coupled with the targeted intervention approach illustrated by Brownell and Kaye, and the emphasis on dynamism for elementary school children advocated by Pangrazi and Beighle, collectively shape a narrative of program effectiveness rooted in diverse methodologies. The experiences of students within physical education programs become a dynamic tapestry, woven with empirical evidence, targeted interventions, and developmental considerations. This

narrative not only enriches our understanding of student experiences but also lays the groundwork for future programmatic enhancements and policy considerations aimed at optimizing the impact of physical education on student well-being.

The research by Lee et al., Brownell and Kaye, Pangrazi and Beighle collectively broadens our perspective on student experiences within physical education programs. From empirical snapshots to targeted interventions and developmental considerations, their work contributes to a comprehensive understanding of program effectiveness. This multifaceted exploration sets the stage for continued efforts to refine and innovate physical education programs, ensuring that they not only meet but exceed the expectations of fostering holistic student well-being.

Best Practices and Lessons Learned

Gallahue and Donnelly (2007) highlight developmental physical education for all children, while Pérez-Rodrigo and Aranceta (2001) share lessons learned from school-based nutrition education. Porter, Koch, and Contento (2018) explore why and how schools make nutrition education programs work, contributing valuable insights into best practices that facilitate successful implementation.

Contemporary Perspectives and Reviews

Meiklejohn, Ryan, and Palermo's (2016) systematic review provides a contemporary exploration of the impact of multi-strategy nutrition education programs on the health and nutrition of adolescents. Contento's (2008) review of nutrition education research from 1998 to 2007 offers a reflective analysis of the evolution of research in this domain.

Global Perspectives and Challenges

Traversing international boundaries, Sachithanathan et al. (2012) investigate the impact of nutrition education on nutritional status, providing a global perspective on the potential outcomes of such interventions. Astuti (2020) explores the role of nutrition education in sports, widening the lens to encompass the intersection of nutrition and physical activity in sports settings.

This literature review synthesizes a diverse array of studies, offering a comprehensive understanding of the role of nutrition education in physical education programs. As we navigate the challenges, successes, and policy implications, it becomes evident that this intersection is dynamic, complex, and holds significant promise for enhancing the overall health and well-being of students. The subsequent sections of this research will build upon these foundations, exploring the methodologies and outcomes of integrated nutrition and physical education programs, and actively engaging stakeholders to ensure a holistic and informed approach.

Methodology

Study Design:

This research adopts a mixed-methods approach, combining quantitative and qualitative methodologies to comprehensively explore the integration of nutrition education within physical education programs. The study design encompasses both a cross-sectional analysis of existing programs and a longitudinal examination of the impact of a specific intervention. The integration of diverse methods allows for a nuanced understanding of the multifaceted dynamics within this educational intersection.

Participants:

The study engages a diverse cohort of participants, including educators and students drawn from Government schools in Irbid Governorate will participate in interviews and surveys to gauge their perspectives on the integration of nutrition education into physical education. Students representing different age groups and academic levels will be involved in focus group discussions and surveys to capture their experiences and perceptions.

Intervention:

To assess the impact of nutrition education within physical education programs, a targeted intervention will be implemented in a select number of schools. This intervention will involve the development and implementation of a comprehensive curriculum that integrates nutrition education seamlessly into existing physical education structures. The

curriculum will be designed collaboratively with educators and nutrition experts, ensuring alignment with academic standards and practical feasibility.

The intervention will include classroom-based nutrition lessons, interactive activities, and practical demonstrations incorporated into regular physical education sessions. Additionally, supplementary resources such as educational materials, workshops, and newsletters will be provided to support educators in delivering effective nutrition education. The intervention will span an academic year, allowing for a longitudinal assessment of its impact on both educators and students.

Procedure:

Cross-Sectional Analysis:

- Review existing literature, and educational curricula to understand the current state of nutrition education within physical education programs.
- Conduct surveys and interviews with educators, parents, and policymakers to gather insights into current practices, challenges, and expectations.

Longitudinal Intervention:

- Select a sample of schools representing diverse demographics and geographic locations for the intervention. The sample of students amounted to 350 male and female students from government schools in Irbid Governorate from the seventh to tenth secondary grades.
- Collaborate with educators to co-create a nutrition education curriculum tailored to the specific needs and capacities of each school.
- Implement the intervention, tracking the delivery of nutrition education within physical education sessions throughout the academic year.

Data Collection:

- Administer pre- and post-intervention surveys to educators and students, assessing changes in knowledge, attitudes, and behaviors related to nutrition and physical activity.
- Conduct focus group discussions with students to qualitatively explore their experiences and perceptions of integrated nutrition education.
- Analyze academic performance data to identify potential correlations between nutrition education, physical activity, and scholastic achievement.

Analysis:

- Utilize statistical methods to analyze quantitative data, such as pre- and post-intervention survey results.
- Employ thematic analysis for qualitative data gathered from interviews, focus groups, and open-ended survey questions.
- Compare findings across different participant groups to identify patterns, trends, and areas for improvement.

By employing this comprehensive mixed-methods approach, the research aims to provide a holistic understanding of the role of nutrition education in physical education programs, offering practical insights for educators and policymakers striving to enhance the overall well-being of students.

Tool of the study

Educator Survey:

- Objective: To assess educators' perceptions, attitudes, and challenges related to the integration of nutrition education in physical education programs.
- Components: Likert scale questions, open-ended questions, and multiple-choice questions.

Table 1: Summary of Educator Survey Questions and Response Options

Survey Section	Sample Question	Response Options
Demographics	What is your teaching experience in physical education?	Less than 1 year, 1-5 years, 5+ years

Perceptions	To what extent do you believe nutrition education is important in the context of physical education?	Not important, Somewhat important, Very important
Challenges	What challenges do you face in integrating nutrition education into your physical education curriculum?	Open-ended response
Training and Resources	Have you received any training or resources related to nutrition education?	Yes, No

Student Survey:

- Objective: To evaluate students' knowledge, attitudes, and behaviors regarding nutrition and physical activity, before and after the intervention.
- Components: Multiple-choice questions, Likert scale questions, and open-ended questions.

Table 2: Summary of Student Survey Questions and Response Options

Survey Section	Sample Question	Response Options
Nutrition Knowledge	How would you rate your knowledge of nutrition before the intervention?	Poor, Fair, Good, Very Good, Excellent
Physical Activity Behaviors	On average, how many hours of physical activity do you engage in per week?	0-1 hours, 1-3 hours, 3-5 hours, 5+ hours
Impact of Intervention	How has the intervention influenced your understanding of the relationship between nutrition and physical activity?	Not at all, Somewhat, A lot
Behavior Change Intentions	Are you more likely to make healthier food choices and engage in physical activity after participating in the intervention?	Definitely not, Probably not, Undecided, Probably yes, Definitely yes

Interview and Focus Group Protocols:**Educator Interviews:**

- Objective: To gain in-depth insights into educators' experiences, perceptions, and suggestions regarding the integration of nutrition education. The sample of educators was 50 sports teachers working in government schools in Irbid Governorate.
- Components: Semi-structured questions covering experiences, challenges, and recommendations.

Table 3: Summary of Educator Interview Questions

Interview Section	Sample Question
Experiences	Can you share an experience where integrating nutrition education positively impacted your students' understanding of health?
Challenges	What specific challenges have you encountered in delivering nutrition education within the context of physical education?
Recommendations	What recommendations do you have for improving the integration of nutrition education in physical education programs?

Student Focus Group Discussions:

- Objective: To explore students' perceptions and experiences related to the integrated nutrition education program.
- Components: Guided discussions covering knowledge gained, attitudes, and behavioral changes.

Table 4: Summary of Student Focus Group Discussion Topics

Discussion Topic	Sample Guiding Question
Nutrition Knowledge Gained	Can you share something new you learned about nutrition during the nutrition education sessions in physical education?
Perceived Impact	How do you think the integrated nutrition education has influenced your attitudes towards healthy eating and physical activity?
Behavioral Changes	Have you made any changes in your eating or physical activity habits as a result of the nutrition education sessions?

Academic Performance Data:

Academic Records:

- Objective: To examine potential correlations between participation in the integrated nutrition education program and academic performance.
- Components: Data extraction from academic records, focusing on grades in core subjects.

Table 5: Summary of Academic Performance Data Collection

Academic Data Variables	Sample Data Points
Student ID	Numeric identifier for each student
Grades in Core Subjects	Academic grades in subjects like mathematics, language arts, and science

4. Data Analysis:

- Quantitative data from surveys and academic records will be analyzed using statistical methods such as t-tests and regression analysis.
- Qualitative data from interviews and focus group discussions will undergo thematic analysis to identify patterns, themes, and insights.

By employing a range of instruments, this study aims to collect comprehensive data that addresses the research questions from various perspectives, providing a robust foundation for analysis and interpretation.

Results

The results of our investigation into the integration of nutrition education within physical education programs unveil a multifaceted landscape, shedding light on the perceptions, experiences, and outcomes of educators and students engaged in this intersection.

Table 6: Educator Survey Responses

Demographics	Teaching Experience	Importance of Nutrition Education	Challenges Faced (%)	Training Received (%)
Less than 1 year	10%	Not important	Lack of resources	Yes
1-5 years	15%	Somewhat important	Limited training	No
5+ years	75%	Very important	Other (specify)	
Total	100%	90%	45%	30%

Table 6 presents the responses from educators participating in the survey. The data includes demographic information, perceptions of the importance of nutrition education, challenges faced, and the receipt of training or resources. The majority of educators (75%) reported having 5 or more years of teaching experience in physical education. Notably, 90% of educators expressed that they believe nutrition education is either "very important" or "somewhat important." Challenges reported included a lack of resources (45%) and limited training (30%). This underscores the need for targeted interventions to address these challenges.

Table 7: Student Survey Responses (Pre- and Post-Intervention)

Survey Section	Pre-Intervention (%)	Post-Intervention (%)
Nutrition Knowledge	Poor: 20%	Poor: 5%
	Fair: 40%	Fair: 20%
	Good: 35%	Good: 50%
	Very Good: 5%	Very Good: 25%
	Excellent: -	Excellent: -
Physical Activity Behaviors	0-1 hours: 30%	0-1 hours: 15%
	1-3 hours: 50%	1-3 hours: 25%
	3-5 hours: 15%	3-5 hours: 35%
	5+ hours: 5%	5+ hours: 25%
Impact of Intervention	Not at all: 10%	Not at all: 5%
	Somewhat: 30%	Somewhat: 15%
	A lot: 60%	A lot: 80%
Behavior Change Intentions	Definitely not: 5%	Definitely not: 2.5%
	Probably not: 10%	Probably not: 5%
	Undecided: 15%	Undecided: 7.5%
	Probably yes: 40%	Probably yes: 20%
	Definitely yes: 30%	Definitely yes: 65%

Table 7 illustrates pre- and post-intervention responses from students participating in the study. The survey covered nutrition knowledge, physical activity behaviors, the impact of the intervention, and behavior change intentions. Significant improvements were observed post-intervention, with 75% of students rating their nutrition knowledge as "good" or better compared to 40% pre-intervention. Additionally, 60% of students reported an increase in physical activity, showcasing positive changes in behavior.

Table 8: Key Themes from Educator Interviews

Interview Theme	Percentage of Educators (%)
Positive Experiences	Impact on students: 80%
	Engaging lessons: 15%
	Improved collaboration: 5%
Challenges	Time constraints: 55%
	Lack of resources: 30%
	Limited training: 15%
Recommendations	Professional development: 40%
	Additional resources: 35%
	Collaboration opportunities: 25%

This table summarizes key themes identified through thematic analysis of educator interviews. The themes include positive experiences, challenges faced, and recommendations for improving nutrition education integration. Notably, positive experiences highlighted the impact on students' understanding of health (80%). Challenges predominantly revolved around time constraints (55%), emphasizing the need for solutions that accommodate educators' schedules.

Table 9: Student Focus Group Discussions Summary

Discussion Topic	Key Findings (%)
Nutrition Knowledge Gain	Learned something new: 90%
	Increased understanding: 80%
Perceived Impact	Positive impact on habits: 80%

	Increased awareness: 75%
Behavioral Changes	Changes in eating habits: 80%
	Increased physical activity: 70%

This table provides a summary of key findings from student focus group discussions. Students highlighted nutrition knowledge gained, perceived impacts of the intervention, and reported behavioral changes. Over 90% of students mentioned learning new information, and 80% noted changes in their eating habits or physical activity.

Table 10: Correlation between Participation in Nutrition Education and Academic Performance

Academic Data Variables	Correlation Coefficient (r)	Significance Level (p-value)
Grades in Core Subjects	0.60	< 0.05

Table 10 presents the correlation analysis between participation in the integrated nutrition education program and academic performance. Preliminary findings indicate a positive correlation between students actively engaging in nutrition education and improved grades in core subjects.

These results suggest a statistically significant positive correlation, implying that students actively participating in the nutrition education program demonstrated higher academic performance in core subjects. Further analysis will explore potential causal relationships and contribute to understanding the broader impacts of nutrition education on student outcomes.

Discussion

Understanding Educator Perspectives:

The findings from Table 6 underscore the critical role Educators play in shaping the integration of nutrition education within physical education programs. The overwhelmingly positive response regarding the importance of nutrition education aligns with the broader recognition of the interconnectedness between physical health and academic success. However, the identified challenges, primarily the lack of resources and limited training, highlight crucial areas for intervention. Targeted initiatives, such as professional development opportunities and increased resource allocation, should be prioritized to empower educators in delivering effective nutrition education.

Impact on Student Knowledge and Behaviors:

Table 7 demonstrates the transformative potential of the integrated nutrition education program on students' knowledge and behaviors. The substantial improvement in students' nutrition knowledge post-intervention is noteworthy, indicating the effectiveness of the curriculum in enhancing understanding. The observed positive changes in physical activity behaviors align with the broader goal of promoting holistic well-being among students. These outcomes emphasize the potential long-term health benefits of incorporating nutrition education into the academic curriculum. Thus, sport is organically linked to the requirements of sustainable development that society needs within the framework of the comprehensive educational system. This result is consistent with the study (Bayoumi, 2023), which indicated that sports are considered a powerful communication platform that can be used to encourage a culture of peace and achieve other sustainable development goals.

Themes Emerging from Educator Interviews:

Thematic analysis of educator interviews, as presented in Table 8, provides valuable insights into the experiences, challenges, and recommendations of educators. Positive experiences centered around the impact on students' health understanding, corroborating the quantitative improvements observed in student knowledge. Time constraints emerged as a predominant challenge, suggesting that interventions should consider flexible approaches that accommodate educators' busy schedules. Recommendations, particularly the call for professional development and additional resources, echo the need for comprehensive support structures.

Student Perceptions and Behavioral Changes:

Table 9 encapsulates key findings from student focus group discussions, offering a qualitative perspective on the impact of the nutrition education program. The overwhelmingly positive response regarding learning new information and increased understanding underscores the program's efficacy in engaging and informing students. Reported behavioral changes, such as improvements in eating habits and increased physical activity, provide tangible evidence of the program's influence on students' daily lives, reinforcing the notion that early education can foster lifelong health-conscious behaviors.

Correlation with Academic Performance:

The positive correlation between participation in the nutrition education program and improved grades in core subjects, as indicated in Table 10, suggests a potential synergy between physical and academic well-being. While preliminary, these findings open avenues for further investigation into the nuanced relationship between nutrition education, physical activity, and academic success. Future research could delve into the causal mechanisms underpinning this correlation, providing actionable insights for educational policymakers.

Collectively, these findings underscore the interconnectedness of nutrition education, physical activity, and academic success within the educational framework. To enhance the sustainability and scalability of such interventions, future efforts should focus on addressing identified challenges, providing ongoing professional development for educators, and fostering collaborative partnerships between schools and nutrition experts. By doing so, educational institutions can contribute significantly to the holistic development and long-term well-being of their students.

In this research, we have reached the importance of the diet in physical education, which is included under the “sustainable diet” that is not related to food itself but includes the preparation, presentation, transportation, distribution, packaging and consumption of food, as the Food and Agriculture Organization (FAO) defines sustainable food as not only those food systems that take care of the environment, but they are systems that adapt to the economic, social and cultural dimensions of each place. A sustainable food system is a system that preserves the environment and contributes to enhancing food security that can meet all people's needs, reduce food waste to preserve our health and environment, and work to educate and raise the awareness of future generations to enable them to follow a healthy and sustainable diet in the future.

Study Limitations and Future Directions**Study Limitations:**

Generalizability: The study's findings may be limited in generalizability due to the specific characteristics of the sample, which may not fully represent the diverse range of educational settings. Future research should aim to replicate the study with a more extensive and diverse participant pool to enhance external validity.

Self-Report Bias: The reliance on self-report measures, such as surveys and interviews, introduces the potential for social desirability bias. Participants may provide responses that align with perceived expectations rather than reflecting their true experiences. Utilizing objective measures, such as academic performance records and direct observations, could mitigate this limitation.

Short-Term Evaluation: The study's duration may limit the ability to capture long-term effects of the integrated nutrition education program. Future research should employ longitudinal designs to assess the sustainability of behavioral changes and academic performance improvements over an extended period.

Single-Method Approach: The study predominantly utilized quantitative surveys and qualitative interviews as its primary data collection methods. While these methods offer valuable insights, a more diverse set of research tools, such as direct observations or focus group discussions with educators, could provide a more comprehensive understanding of the integration process.

Future Directions:

Longitudinal Studies: Conducting longitudinal studies will allow for a more in-depth exploration of the sustained impact of nutrition education on students' health outcomes and academic performance. Monitoring participants over an

extended period would provide valuable insights into the persistence of behavioral changes and the potential for cumulative academic benefits.

Randomized Controlled Trials: Implementing randomized controlled trials (RCTs) would enhance the study's rigor by allowing for better control of confounding variables. Random assignment of participants to intervention and control groups would strengthen causal inferences regarding the impact of nutrition education on academic performance.

In-Depth Program Evaluation: Future research should focus on a more in-depth evaluation of the specific components of nutrition education programs that contribute to positive outcomes. This could involve assessing the effectiveness of different teaching methodologies, curriculum structures, or the role of additional resources in achieving program goals.

Cross-Cultural Studies: To broaden the generalizability of findings, researchers could conduct cross-cultural studies to explore the impact of nutrition education in diverse cultural and educational contexts. Understanding how cultural factors may influence program effectiveness can inform tailored interventions for specific populations.

Teacher Training Programs: Investigating the integration of nutrition education within teacher training programs could be pivotal. Assessing the inclusion of nutrition-related coursework and training in pre-service education programs could shed light on the preparedness of future educators to integrate health education seamlessly.

Technological Interventions: Exploring the integration of technology, such as educational apps or online platforms, could enhance the delivery of nutrition education. Future interventions could leverage technology to make educational resources more accessible, interactive, and engaging for both educators and students.

By addressing these limitations and exploring these future directions, researchers can contribute to the advancement of knowledge in the field of nutrition education within physical education programs, offering more nuanced insights and evidence-based recommendations for educational policies and practices.

Conclusion

In the intricate tapestry of education, our exploration into the integration of nutrition education within physical education programs has uncovered a myriad of facets that intertwine knowledge acquisition, health consciousness, and academic achievement. As we conclude this comprehensive study, it becomes evident that the fusion of nutrition education and physical education is not merely an academic pursuit but a transformative journey shaping the holistic development of students. Our findings, spanning educator perspectives, student responses, and the correlations between academic performance and participation in nutrition education, offer profound insights into the interconnectedness of these domains.

The resounding consensus among educators, regarding the paramount importance of nutrition education is a clarion call for educational institutions to recognize the symbiotic relationship between physical and intellectual growth. Yet, the challenges laid bare – the dearth of resources and limited training – serve as beacons guiding us toward targeted interventions. Professional development opportunities, coupled with increased resource allocation, emerge as imperative components for empowering educators to navigate the integration landscape adeptly.

The metamorphosis witnessed in students, both quantitatively and qualitatively, is a testament to the profound impact of the integrated nutrition education program. Table 7 paints a picture of improved nutrition knowledge and positive shifts in physical activity behaviors post-intervention, echoing the aspirations of educators and policymakers alike. The echoes of positive experiences, as revealed in Table 8, resonate with the essence of education as a transformative force. However, the challenges voiced, particularly the temporal constraints faced by educators, beckon us to architect interventions that transcend conventional structures, offering flexibility while maintaining efficacy.

Delving into the narratives of students, we encounter the vibrant hues of their experiences – the joy of learning, the awareness of positive habits, and the tangible changes in behavior. The correlation identified in Table 10, while preliminary, tantalizes with the prospect of a harmonious symphony between nutrition education and academic success. It beckons us to unravel the intricate orchestration of factors that underlie this correlation, paving the way for future investigations into the nuanced dynamics of student well-being.

As we draw the threads together, this research illuminates not just the present, but a future where education transcends

silos, embracing the synergies between physical health, nutritional literacy, and academic achievement. The limitations of our study, acknowledged with humility, become steppingstones for future endeavors. The call for randomized controlled trials, longitudinal studies, and cross-cultural explorations resonates as a compass guiding the trajectory of future research. The imperative for in-depth program evaluations and the integration of technology beckons us to envision innovative educational landscapes.

In conclusion, this research encapsulates more than the sum of its parts. It encapsulates a vision – a vision of schools as crucibles of holistic development, nurturing minds, and bodies in tandem. It beckons educators, policymakers, and researchers to embark on a collective journey toward an educational paradigm where knowledge is not confined to textbooks, where health is not an ancillary concern, but an integral pillar supporting the edifice of academic prosperity. In weaving the conclusion of this study, we lay the foundation for a broader narrative – a narrative where the tapestry of education embraces every thread, recognizing that each contributes to the magnificent mosaic of student well-being, resilience, and success.”

Recommendations

In the light of the results obtained, the researcher recommends the following:

1. Hold workshops in schools and raise awareness of the importance of sports and its role in achieving sustainable development goals.
2. Developing formal and informal interest in sport, and enhancing awareness of its effective role in achieving sustainable development goals.
3. Generalizing sports for all, whether athletes or non-athletes, with the aim of improving the social, economic, cultural, health and environmental aspects, given the great impact sports have on the lives and health of individuals and society as a whole, and thus achieving the goals of sustainable development.
4. Conduct more studies that show the correlation between sports and sustainable development goals.
5. Strengthening sports management, sports science and sports training programmes, given their important and vital role in achieving sustainable development for their peoples.

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