

Student Innovation Performance: Underpinning Theories

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ABSTRACT

This study explores the relationship between extracurricular activities and student innovation performance, drawing on various theoretical frameworks and empirical evidence. Through a comprehensive literature review, the study examines the impact of extracurricular activities on students' development of critical thinking, creativity, communication, and collaboration skills—essential components of innovation. The TRIZ innovation theory and social cognitive career theory provide theoretical underpinnings for understanding how participation in extracurricular activities fosters innovation skills among students. Additionally, the study presents a literature review matrix summarizing key findings from previous research on extracurricular activities and their effects on student development. The findings suggest that participation in extracurricular activities significantly enhances students' capacity for innovation by cultivating higher-order thinking skills and providing opportunities for real-world problem-solving. Moreover, the study discusses the implications of extracurricular engagement for students' future career success and organizational innovation. The study concludes with recommendations for future research, emphasizing the need for comparative studies across diverse student populations, in-depth analyses of specific types of extracurricular activities, and exploration of cultural differences in attitudes toward extracurricular involvement. Overall, this study contributes to a better understanding of how extracurricular activities influence student innovation performance and provides insights for educators and policymakers seeking to enhance innovation capabilities among young professionals

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1. INTRODUCTION

Students can improve their capacity to think creatively and develop other important work-related abilities by participating in a variety of extracurricular activities outside of the classroom. A person's critical and creative thinking capacity can also be developed by participating in extracurricular activities such as science displays or projects. According to the findings of Gibbs and Poisat's research (2020), which demonstrated the relation between participation in science fairs and the development of innovation skills, the involvement in science projects that are exhibited in science fairs is an influencer of innovation. The research also explained the relation between participation in science fairs and innovation skills development. Participation in scientific fairs by local community members is widely seen as a component that propels an innovative culture. The educational significance of science fairs is tremendous, particularly in science and

technology domains. Science fairs are typically held outside the classroom as an extracurricular activity in educational settings or community involvement fields. Participation in scientific fairs allows students to develop a number of key skills, the most significant of which is originality. However, students also develop other essential qualities, such as curiosity and self-confidence (Mbowane, 2016).

In a similar vein, additional extracurricular activities each have their own educational importance and are required as part of the academic life. This is done to ensure that children develop the necessary skills to be able to act appropriately in the future regardless of what may lie in store. And most importantly, it is common knowledge that activities outside of the classroom are of the utmost significance for enhancing the innovative capabilities of students. This is because innovative capabilities cannot be developed solely by acquiring theoretical knowledge in the classroom.

The study intends to achieve its goal through the following objectives:

1. To investigate how student innovation performance can be improved through the underpinning theories.
2. To investigate the impact of innovation theories on student innovative performance.

To this end, the following research questions were generated:

1. How student innovation performance can be improved through the underpinning theories?
2. What are the impact of innovative theories on student innovation performance?

This study is intended to contribute to the advancement of knowledge in the field of innovation performance and innovation performance theories. The study also contributes by investigating the impact of the innovation theories on student innovation performance.

The study commenced by highlighting the background of the study in the introduction section which is section 1. Section 2 outlined the literature review on the topic where in section 3 introduced the methodology adopted in conducting the study. Thereafter, section 4 discussed the results arrived at and section 5 discussed the findings and suggested future research directions.

2. LITERATUR REVIEW

2.1. TRIZ innovation theory

The TRIZ hypothesis asserts that creative thinking is a latent that resides within every person and that this talent, like any other, may be improved through consistent practise. Students can increase their learning capacities to generate creativity for functional successes by cultivating creative educational concepts in the classroom. In this context, extracurricular activities, also known as ECA, significantly impact the value of information and comprehension, which in turn leads to creativity. According to Wu and Chen (2021), innovation education involves instrumental knowledge and comprehensive information, which creates an eagerness to produce something creative and enhances learning efficiency. This theory is accountable for the first discovery of difficulties and the use of general algorithms of innovation if dealing with optimal solutions is necessary. The application of TRIZ theory to redesign educational curricula in K-12 institutions, as well as colleges and universities, by incorporating innovative teaching methods that cater to the characteristics of customised cultivation for quality enhancements, is quite valuable. On the other hand, this theory has helped students get favourable views regarding learning and growth, which has assisted in guiding or assisting them in the process of professional development.

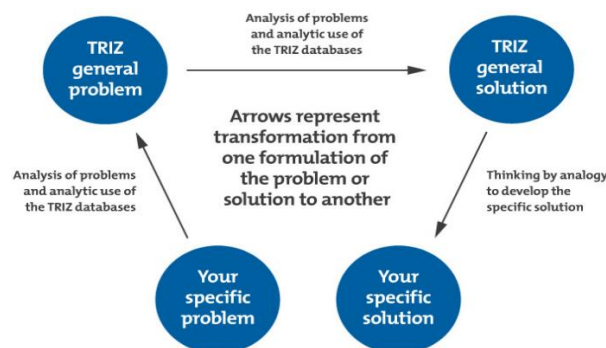


Figure 1: TRIZ innovation theory (Source: Huang & Cheng, 2022)

2.2. Social cognitive career theory

Social cognitive career theory has centered on the career development prospects of individuals based on academic and professional experiences. In this context, cognitive responses are used as the power to

cultivate new things by ensuring understanding abilities. On the other hand, cognitive sense development is enhanced through extracurricular activities which enormously contribute to performance development. As per the view of Ali et al. (2018), cognitive behaviour allows to improve altruistic behaviour which can have greater importance in making changes for parenting learning opportunities.

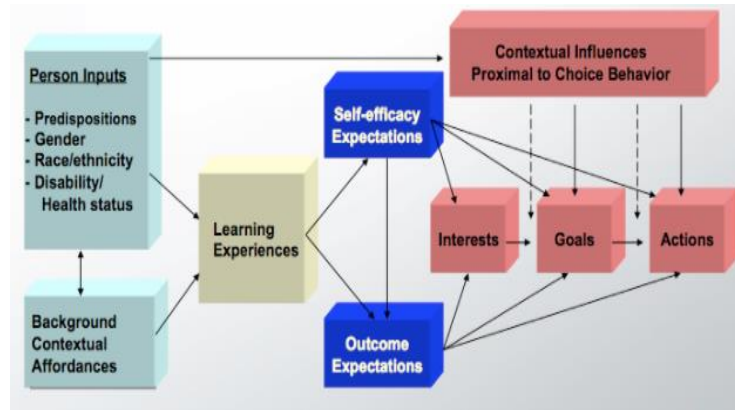


Figure 2: Social cognitive career theory
(Source: Brown & Lent, (2019))

2.3. Literature Review Matrix

Every student is subjected to considerable pressure to succeed and make a name for themselves in the sector of their choice. Therefore, the students must develop their emotional maturity. Because of this, they become more adept at controlling educational measures, which in turn boosts their potential for advancement. Stress that is not necessary should not be put on the students. This help makes it much simpler to realise the goals of leading a well-rounded and balanced life as a student. Both the spoken and written expressions of the students will benefit from this. This essential component helps along the development of the student's sense of self-confidence.

Table 1: Some Former Research on Extracurricular Activities

No.	Title	Author	Year	Conclusion
1	Extracurricular activities and social entrepreneurial leadership of graduating youth in universities from the Middle East	Bodolica et al.	2021	The discussed case study seeks to reconceptualise the institution of higher education as a place of not just learning, but also experimenting, growing and acting through the development
2	Developing co-curricular activities and extracurricular activities for all-round development of the undergraduate students: a study of a selected public university in Bangladesh	Md. Roknuzzaman Siddiky	2019	the paper suggested that the Government and the authority concerned should undertake proper measures for organizing diverse CCAs and ECAs properly and thereby ensure quality education and attain SDGs
3	Sense of belonging in second-year undergraduate students: the value of extracurricular activities	Sisto et al.	2021	The study offers important implications for universities about how to benefit from this approach in seeking to meet the distinctive needs of second-year students and developing well-targeted programmes to increase their satisfaction and academic achievements, and ultimately retention – a weakness still seen in the literature.

4	The acquisition of teamwork skills in university students through extracurricular activities	Creo et al.	2021	The results show the students to have highly developed interpersonal and communication skills, followed by adaptation and decision-making skills. The lowest scores corresponded to coordination and leadership skills. On the other hand, a significant correlation was established between extracurricular activities and the acquisition of essential teamwork skills.
5	Past and present participation in extracurricular activities is associated with adaptive self-regulation of goals, academic success, and emotional wellbeing among university students	Guilmette et al.	2019	Our results showed that university students' past and present ECAP was positively associated with goal self-regulation strategies, which, in turn were related to higher levels of academic success and emotional wellbeing. Universities and colleges should encourage ECA participation to support positive adjustment outcome
6	Using Children Literature as an Extracurricular Activity	Al- Najjar, A. M.	2023	Case study on using children's literature in EFL classrooms.
7	Exploration of students' creativity based on demography	Alizamar, A., Afdal, A., Ifdil, I., & Syahputra, Y.	2019	Examines students' creativity based on demographic factors.
8	Needs and factors for developing professional	Mahammadovna, S. I.	2021	Examines needs and factors for developing students' abilities.
9	Extracurricular activities as an important tool	Fakhretdinova, G., Osipov, P., & Dulalaeva, L.	2021	Highlights the importance of extracurricular activities.
10	Employability: Smart learning in extracurricular activities	Hui, Y. K., & Ip, H. H. S.	2021	Discusses smart learning in extracurricular activities.
11	The role of club activities in the development	Pardayevna, H. N.	2022	Explores the role of club activities in developing musical abilities.
12	Individual knowledge creation ability: dispositional	Sarwat, N., & Abbas, M.	2021	Investigates individual knowledge creation ability and its relationship to innovation performance.

Source: Authors

3. METHOD

The study adopted a narrative analysis after generating the relevant documents from the Scopus database. The Scopus database is one of the reliable databases research documents are generated. The study identified 113 relevant documents in the Scopus database. The filtration approach proposed by Scopus in their database was utilised with promising results. The refinement process began by the identification of the 113 documents in the Scopus. Year of publication, Subject area, document types, language and keywords were all considered before arriving at 57 relevant articles that are eventually available to carry out the research. The 57 articles that were finally identified for the conduct of the research were later studied and analysed to establish a meaning from them. These articles were relevant to the study at hand and various insights were generated during the narrative analysis that was carried out. Most of the papers discussed the significance of student innovation performance and the theories supporting innovation performance in general. Other articles were basically on the methods of innovation performance and the process of implementing the innovation performance. The narrative analysis made has brought to the fore many details that will be pivotal in arriving at meaningful and insightful results from the study. However, the filtration processed carried out was highlighted through a PRIMSA process as contained in Figure 3 below.

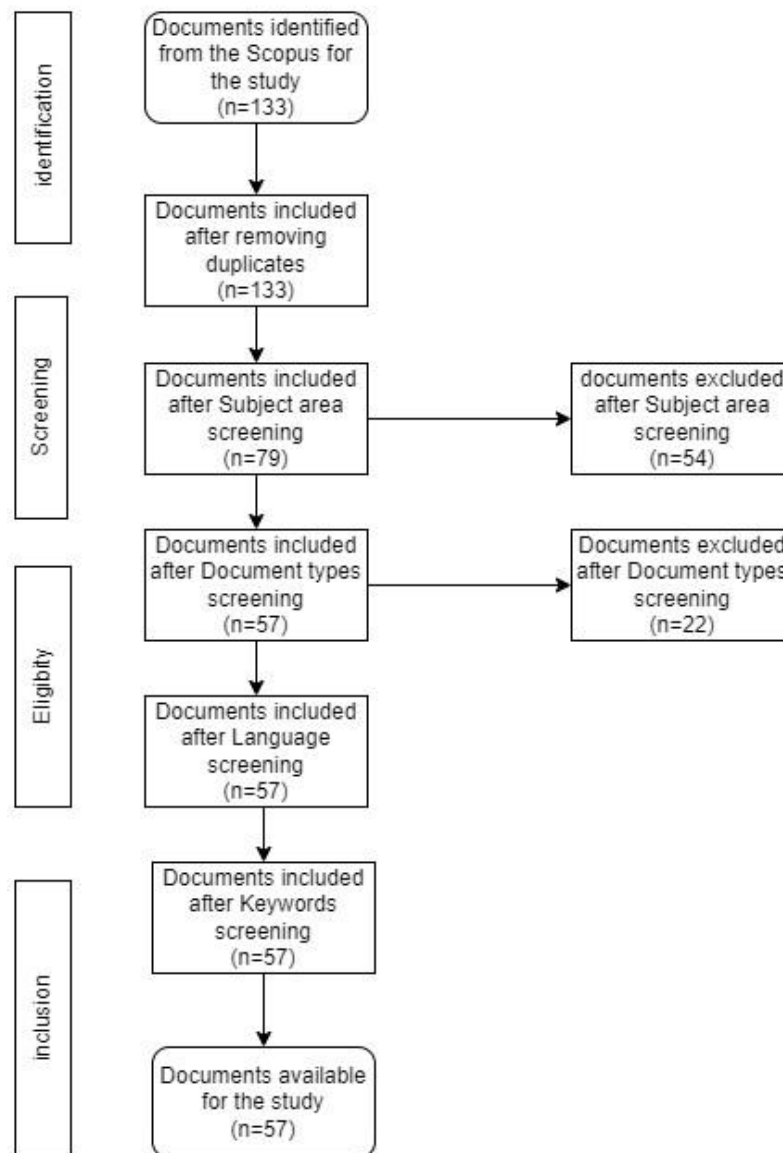


Figure 3. PRISMA process for document generation and filtration

4. RESULTS AND DISCUSSION

The research findings on the student innovation performance often draw upon various underpinning theories to understand the factors influencing creativity, problem-solving, and entrepreneurial behaviour among students. One prominent theoretical framework is the social cognitive theory, which emphasizes the role of observation, imitation, and modelling in shaping individuals' behaviours and cognitive processes. According to this theory, students' innovation performance is influenced by their perceptions of self-efficacy, outcome expectations, and the socio-cultural context in which they operate. Research has shown that students with high levels of self-efficacy, or belief in their ability to succeed in innovative tasks, are more likely to engage in creative endeavours and persist in the face of challenges, ultimately leading to greater innovation performance.

Additionally, the theory of multiple intelligences proposed by Howard Gardner suggests that individuals possess diverse intellectual strengths and abilities that contribute to their innovative capacities. According to this theory, students may excel in different forms of intelligence, such as linguistic, logical-mathematical, spatial, musical, bodily-kinesthetics, interpersonal, intrapersonal, and naturalistic intelligence. Research findings indicate that cultivating and leveraging these multiple intelligences through tailored educational experiences can enhance students' innovation performance by providing them with opportunities to explore and apply their unique strengths in creative problem-solving and idea generation tasks.

Furthermore, the innovation diffusion theory posits that the adoption and dissemination of new ideas, products, or practices follow a predictable pattern characterized by stages such as awareness, interest, evaluation, trial, and adoption. This theory underscores the importance of understanding the factors influencing the diffusion of innovation within educational settings and identifying strategies to accelerate the adoption of innovative practices among students. Research has demonstrated that factors such as perceived relative advantage, compatibility, complexity, trialability, and observability influence students' willingness to adopt and integrate innovative approaches into their learning processes, ultimately impacting their innovation performance.

Lastly, the self-determination theory emphasizes the importance of intrinsic motivation, autonomy, and competence in driving individuals' engagement and performance in innovative activities. According to this theory, students are more likely to demonstrate high levels of innovation performance when they feel intrinsically motivated to pursue creative endeavours, have opportunities to exercise autonomy and decision-making in their learning experiences, and perceive themselves as competent in their ability to innovate. Research findings suggest that fostering a supportive and autonomy-supportive learning environment, providing opportunities for student choice and self-directed learning, and offering constructive feedback and recognition for innovative efforts are critical factors in enhancing students' innovation performance.

5. DISCUSSION AND FUTURE RESEARCH DIRECTIONS

In this sense, extracurricular activities are included in the educational system as a means of enhancing the value of the activities that are part of the curriculum. Students who participate in extracurricular activities develop the ability to deal with unknown situations, which in turn leads to the development of new solutions. Students' creative abilities are further developed as a result of their experiences outside of the classroom. In academia, creativity plays a vital role because it enables students to make effective use of the information and resources that have been made available to them throughout their education at the educational institution (Rukajat et al., 2021). In order to foster students' creative potential, it is essential for educational institutions to present students with opportunities to participate in competitive environments and to collaborate together on projects.

As a result of the intense rivalry that exists in the business world and the rapid rate at which things change, it is essential for businesses to hire staff members who are creative thinkers and possess the abilities necessary to successfully navigate consistently shifting environments. Higher education institutions are anticipated to make it easier for companies to find applicants that demonstrate innovative performance (Tomasova, 2020). The culture of innovation ought to be cultivated in academic life so that it might produce value in the students' subsequent professional lives. Because of the students' inventive abilities, they will be able to work effectively toward the completion of the objectives of innovative initiatives, mostly those associated with their professional lives (Tomasova, 2020).

According to the findings of research carried out by Dungs et al., (2017), the participation of students in extracurricular activities is beneficial to the development of their learning experiences as well as their capacity for innovation. To a large extent, the pupils' cognitive and thinking capacity level determines how well they develop competence in creativity. Students' thinking abilities can be improved by participation in extracurricular activities such as role-playing and theatre. These activities also assist them to empower themselves with imagination and creativity, which in turn enables students to think in novel ways (Kuimova&Polyushko, 2015). The ability to improve critical reasoning, communication, collaboration, and more favourable interpersonal relationships is another benefit of dramatization (Kuimova et al., 2016).

An essential element of innovation is the capacity for creative problem-solving and the generation of innovative ideas in response to challenges (Nakano & Wechsler, 2018). It is essential that these innovative ideas be able to solve a problem in the real world. Students with this ability are more likely to be adaptable to changing circumstances, innovative in the face of obstacles, and able to come up with original and workable solutions to various difficulties. Innovation may be broken down into its component pieces: teamwork, conversation, analysis, and creativity (Retnawati et al., 2018). These four determinants are critically important to the capacity for innovation. It has been demonstrated that when students take part in extracurricular activities, their critical thinking and creative abilities improve.

Students are able to acquire higher-order thinking skills through the learning of methods that stimulate innovative thinking. Students need to broaden their understanding of a variety of topics and subjects in order to develop the critical thinking skills necessary to effectively recognize and address academic challenges. This will allow students to develop the critical thinking skills necessary to effectively recognize and address academic challenges (Jaenudin et al., 2020). By participating in these activities outside of school, students gain an appreciation for the importance of intellectual capability and critical thinking abilities (Bakoban&Aljarallah, 2015). Students who are members of an educational club, such as a debate club, have the opportunity to collaborate with their peers, which helps to nurture the development of skills related to cooperation and

communication and the capacity to think critically. Participation in debate competitions allows students to improve their skills even further.

Engaging in creative activities such as writing and visual arts encourages pupils to think creatively, which in turn promotes the growth of novel, practical ideas that can contribute to the advancement of the creative process. In a similar vein, engaging in creative activities such as writing and visual arts encourages pupils to think creatively. Putting what you've learned in the classroom to use in the real world is a terrific opportunity that may be found through participation in extracurricular activities (Nghia, 2019). Because of this, one is able to make more informed decisions and come up with more effective responses to challenging situations. Communication, collaboration, critical thinking, the generation of ideas, and brainstorming are all processes that function more effectively when they are integrated into a wider group effort. In this environment, it is crucial for students to be able to think independently and creatively on their own. Although creativity and innovation are not the same thing, an innovative mind can help nurture creativity by igniting fresh ideas for improving old goods or methods. Although the two phrases are not interchangeable, creative minds can help foster innovation.

6. CONCLUSION AND FUTURE RESEARCH DIRECTIONS

The study has made significant additions to our understanding of the connection between extracurricular activities and innovative performance among college students. These contributions have been made possible by the findings of the study. This work has opened the door to a number of fascinating new lines of inquiry that could be pursued in the future. These points of departure have the ability to help us learn more about this, go further into the complexity of it, and resolve some of the limitations that the research imposes on us.

In prospective research, there should be some consideration given to the possibility of conducting comparison studies across a wide range of schools, each of which has a diverse student body, in order to increase the internal and external validity of the results. In subsequent research, it may be beneficial to do more in-depth analyses of certain types of extracurricular activities that fall under these broad categories than were conducted for this particular study. These kinds of analyses were carried out for the purpose of this particular study. Academics have the ability to explore the unique effects of artistic participation on creative output and inventive thinking in two areas: the performing arts and the visual arts. These are the two fields that include the visual arts and the performing arts. Even within the realm of sports, other pursuits such as games and hobbies can provide a wide range of results.

It has been proven that participation in extracurricular activities encourages creativity and the development of new ideas through a range of various routes and mediators, therefore this topic need to be the subject of future research. Similarly, research may investigate the relationship between the two. It has been demonstrated in a number of studies that students who take part in extracurricular activities are more likely to produce creative ideas than their peers who do not take part in such activities. This is in contrast to students who do not take part in such activities. It is vital to have a good understanding of the processes that are involved in the operation of extracurricular activities in order to guarantee that extracurricular activities have the greatest beneficial influence possible on participants.

To encourage new ways of thinking among college students and to inspire creative methods to problem resolution among these individuals, researchers and educational institutions might collaborate to develop and assess extracurricular programmes and therapies. These kinds of endeavours have the ability to combine evidence-based tactics like creative training, design thinking seminars, and mentorship programmes, amongst others. Educational institutions such as colleges and universities stand to benefit a great lot by doing extensive research on the effectiveness of various therapies when they are aiming to maximise the quantity of extracurricular activities available for skill development.

Because education is becoming more globalised, it is essential that future research take into account cultural differences in perspectives and attitudes toward extracurricular activities, creativity, and innovation. Research that is conducted across many cultural boundaries can shed light on the differences that occur between various geographic regions. New extracurricular pursuits, such as online communities, virtual teams, and digital creation platforms, have become feasible as a result of the change brought about by information technology. These are just some of the many new opportunities available. The impact that more technologically advanced pastimes have on the development of creative and imaginative skills ought to be a key area of concentration for research in the years to come, and it should be one of the most important areas of focus. To gain significant insight into the development of strategies that make use of technology to nurture inventiveness and creativity in higher education, it is helpful to have an understanding of the distinct dynamics that lay at the foundation of each of these endeavours.

The subject of how academic work and extracurricular activities influence one another in terms of inventiveness and originality presents itself as an intriguing study issue that may be investigated. This is something that could be done. How do these two facets of life in college interact with one another, and is there a method to better integrate them together if at all possible? Studies may be conducted in the future to investigate ways to link the learning that occurs in the classroom with the activities that occur outside the classroom in order to maximise innovation and creativity.

In conclusion, the findings of this study contribute new information to the existing body of knowledge regarding the ways in which students' extracurricular activities influence the levels of creativity and originality displayed by them. This information contributes to the body of knowledge regarding the ways in which extracurricular activities influence the levels of creativity and originality displayed by college students. In this rapidly developing subject field, the selected future study routes provide a road map for further investigation and improvement of existing methods. This will make it possible to have a better understanding of how engagement in extracurricular activities affects the creative and innovative capacities of young professionals just starting out in their careers.

The result of the research findings regarding health education within the scope of physical education in primary and secondary schools underlines its crucial role in promoting overall wellness and healthy behaviours among students. Numerous studies have shown that infusing health education into physical education curricula breeds significant improvements in students' knowledge of health-related topics, including nutrition, physical fitness, personal hygiene, mental health, and substance abuse prevention. For instance, research has demonstrated that students who receive comprehensive health education within physical education classes exhibit greater awareness of healthy eating habits, engage in regular physical activity, and demonstrate better hygiene practices compared to their peers who do not receive such education.

Moreover, health education in physical education programs has been linked to positive changes in students' attitudes and behaviours towards physical activity and overall health. Studies have found that students who participate in health-focused physical education classes tend to have more positive attitudes towards exercise, perceive physical activity as enjoyable and beneficial, and are more likely to engage in lifelong fitness activities. Additionally, integrating health education into physical education can help address public health concerns such as obesity, sedentary attitude, and chronic diseases by promoting healthy lifestyle choices and encouraging students to adopt active and balanced lifestyles from an early age.

Furthermore, research suggests that health education in physical education programs contributes to the development of essential life skills and competencies among students. By providing opportunities for experiential learning and skill-building activities, physical education classes serve as platforms for teaching students critical skills such as goal setting, decision making, problem-solving, communication, and teamwork. These skills are not only vital for promoting health and well-being but also for empowering students to make informed choices, navigate challenges, and thrive in various aspects of their lives beyond the classroom.

Overall, the research findings highlight the importance of health education within physical education programs in primary and secondary schools for promoting students' overall health, well-being, and academic success. By integrating health education into physical education curricula, schools can equip students with the knowledge, skills, and attitudes necessary to lead healthy and active lives, thereby laying the foundation for lifelong wellness and contributing to the prevention of health-related problems in the future.

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