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Sport Climbing as an Extracurricular Activity in Primary School

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Abstract

Sport climbing is experiencing a rapid surge in popularity within the Slovenian educational landscape, largely driven by international competitive success and a growing recognition of its multifaceted benefits for childhood motor development, including significant improvements in coordination, flexibility, endurance, and upper-body strength. Despite the widespread installation of climbing infrastructure in school gymnasiums across the country, a critical research gap persists regarding the effective utilization of these facilities, as recent data indicates that over fifty percent of physical education teachers report a lack of professional competence and technical confidence in delivering climbing-specific content. To address this institutional challenge, the present study employs a descriptive methodological framework and a synthesis of expert pedagogical experience to develop a comprehensive instructional system specifically tailored for the primary school environment. The research centers on the critical paradigm of equipment literacy as a foundational safety prerequisite, moving beyond mere technical operation to foster a deep-seated culture of responsibility and risk management among young learners. The primary output of this study is a structured, evidence-based curriculum featuring nine progressive lesson plans designed to span three distinct three-year developmental periods, ensuring that skill acquisition is age-appropriate and methodologically sound. By prioritizing the safety chain and the implementation of top-rope climbing utilizing modern self-locking belay devices, the study provides a scientifically grounded and ready-to-use resource that bridges the prevailing gap between available school infrastructure and teacher instructional capacity. This framework ultimately enhances the quality of extracurricular sports programs, promotes institutional safety standards, and fosters a sustainable culture of lifelong physical literacy and athletic engagement among primary school students.

Keywords: *sport climbing; extracurricular activities; natural forms of movement; climbing technique; motor skills.*

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Introduction

The landscape of youth sports in Slovenia has undergone a transformative shift over the last decade, with sport climbing emerging from a niche subculture to a mainstream athletic pursuit. This meteoric rise in popularity is not an isolated phenomenon but is deeply rooted in the extraordinary international success of Slovenian athletes. Most notably, the achievements of Janja Garnbret, who secured Olympic gold medals at both the Tokyo 2021 and Paris 2024 Games, have served as a powerful catalyst for interest among primary-school-aged children. This cultural momentum has led to a significant increase in the installation of climbing infrastructure within school premises. However, a paradoxical situation has emerged: while the physical facilities, specifically high climbing walls are increasingly available in school gyms, they frequently remain underutilized or entirely unused (Došler, 2018).

The underutilization of these resources is primarily attributed to a critical gap in professional competence among physical education (PE) teachers. Unlike traditional team sports or gymnastics, sport climbing involves a high degree of technical complexity and perceived risk. Effective instruction on large climbing walls requires not only a mastery of motor movement but also a profound understanding of specialized equipment, including climbing harnesses, ropes, and various belay devices. Furthermore, the teacher must possess the pedagogical skill to manage group dynamics in a high-stakes environment where safety protocols must be absolute. Mercina (2023) highlights that just over 50% of PE teachers do not feel sufficiently competent to implement climbing content within the regular curriculum. This lack of confidence often results in climbing walls being relegated to decorative features of the gymnasium rather than active learning tools.

To address this gap, this study proposes that the most effective vehicle for integrating sport climbing into the primary school environment is the "extracurricular activities" program. Within the Slovenian educational system, extracurricular activities represent a vital component of the annual work plan of individual schools. These programs are designed to be flexible, allowing schools to adapt their offerings based on available infrastructure, environmental factors, and the specific interests of the student body (Kolar, 2008). Unlike the mandatory curriculum, these activities are voluntary and typically conducted immediately following regular classes, providing a time-efficient and cost-effective option for both students and parents.

The fundamental purpose of these extracurricular activities is to foster students' areas of interest with an emphasis on the quality of implementation. This educational format is grounded in the development of both the instructional and social fields, encouraging students to engage in productive thinking while remaining holistically, mentally, and emotionally active. Within this framework, the role of the mentor or teacher is shifted from a traditional instructor to an advisory figure. Through modern pedagogical methods, mentors enable students to co-create their learning programs, thereby acquiring new knowledge in a more participatory and engaged manner (Kolar, 2008).

The integration of sport climbing into this extended school program is particularly beneficial due to its unique impact on the physical and psychological development of children. Climbing is a comprehensive movement discipline that improves coordination, flexibility, endurance, and balance. It is particularly effective in strengthening the musculature of the arms and the shoulder girdle, which is a critical developmental requirement during the primary school years. While traditional gym equipment such as wall bars, ladders, and poles can facilitate some of these benefits, they lack the

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engagement and modern appeal of sport climbing (Möscha, 2008). The aesthetic and athletic allure of climbing high walls provides a level of motivation that traditional exercises often fail to achieve.

From a legislative perspective, the structure of Slovenian schooling since the country's independence in 1991 has explicitly defined the distinction between mandatory and extended programs. The mandatory program includes compulsory subjects and elective hours, while the extended program which the school is legally obligated to offer includes after-school care and extracurricular activities (Komljanc et al., 2007). These sports-focused extracurricular activities are essential for balancing the academic rigors of the mandatory program. They satisfy the individual needs of students, strengthen self-esteem, and help develop social values that contribute to a higher quality of life (Kolar, 2011).

Despite the clear benefits and the legislative support for such programs, the "competency gap" remains the primary obstacle. The novelty of this research lies in its attempt to bridge this gap by moving beyond general athletic theory to provide a specific, technical, and pedagogical bridge for PE teachers. While general literature on climbing techniques is available, there is a distinct lack of structured instructional material that addresses the specific constraints of the school environment, such as high student-to-teacher ratios and limited session times. Teachers often find themselves caught between a desire to offer modern sports and a fear of safety liabilities due to insufficient "equipment literacy."

Equipment literacy in this context is not merely the ability to identify gear but the comprehensive understanding of the "safety chain"—the interconnected system of the climber, the knot, the rope, the belay device, and the anchor point. This research emphasizes the use of modern safety tools, such as self-locking or "self-actuating" belay devices (e.g., the Petzl GriGri), which provide an additional layer of security compared to traditional manual devices. Furthermore, the study advocates for "top-rope" climbing as the foundational method for school instruction. By securing the rope to a top anchor before the climber begins, the risk of a significant fall is virtually eliminated, making it the safest and most effective method for teaching beginners in a group setting.

The objective of this study, therefore, is to present a systematized framework of climbing content that includes both theoretical foundations and practical examples. This framework is designed to facilitate the teacher's work by providing a structured progression of difficulty, thereby increasing the teacher's confidence and the students' engagement. By providing clear, visual, and practical guidelines, this research intends to transform the underutilized climbing walls of Slovenian schools into vibrant hubs of physical development.

The culmination of this research is the development of nine distinct lesson plans. These plans are strategically divided into three separate three-year periods, covering the entire span of primary education. This longitudinal approach ensures that the content is age-appropriate, starting with basic movement games and equipment familiarity for younger children and progressing toward technical belaying skills and advanced climbing techniques for older students. In doing so, this study provides a "turn-key" solution for PE teachers, allowing them to implement a high-quality sport climbing program that is safe, educational, and professionally rewarding.

Ultimately, the implementation of sport climbing as a structured extracurricular activity does more than just fill an hour of the school day. It introduces students to a culture of safety, trust, and physical problem-solving that is useful both in sports and in everyday life. By empowering teachers with the right knowledge and tools, we can ensure that the "Garnbret effect" translates

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into a lasting legacy of physical literacy for the next generation of Slovenian students.

Method

The present study utilizes a qualitative, descriptive research design grounded in pedagogical curricular planning. The primary objective was to develop a structured instructional framework for sport climbing within the Slovenian primary school system, addressing the identified competency gap among physical education (PE) teachers. The methodology is divided into three distinct phases: literature analysis, expert-led instructional synthesis, and curricular modeling.

To establish a robust theoretical foundation, a systematic review of existing academic and professional literature was conducted. The scope of this analysis included Slovenian national legislation regarding the "Extended School Program," pedagogical theories of extracurricular engagement, and technical manuals for sport climbing safety.

Primary sources included the foundational works of Kolar (2008, 2011) and Komljanc et al. (2007) to define the institutional boundaries of extracurricular activities. Technical standards were derived from the official documentation of the Planinska zveza Slovenije (PZS) and the Komisija za športno plezanje (KSP) (2024). Furthermore, recent empirical data regarding teacher competence (Došler, 2018; Mercina, 2023) were analyzed to identify the specific technical barriers—such as equipment literacy and safety chain management—that the proposed curriculum needed to address.

The second phase of the methodology involved a synthesis of practical expertise to translate high-level technical skills into age-appropriate pedagogical content. This process employed a "Skill Acquisition" framework, which prioritizes the gradual transition from basic motor coordination to complex technical operation.

The selection of climbing techniques and safety protocols was governed by two criteria: Safety Maximization and Instructional Scalability. For instance, the decision to prioritize the use of self-locking belay devices (e.g., the GriGri) over traditional manual devices was based on a comparative analysis of safety margins in large-group settings. Similarly, "top-rope" climbing was selected as the primary instructional method due to its inherent safety for beginners and its efficiency in high-occupancy gym environments. This phase ensured that the resulting curriculum was not merely a list of exercises but a methodologically sound progression.

The final phase involved the design of the instructional units. The curriculum was modeled to align with the developmental stages of primary education in Slovenia, which is traditionally divided into three three-year cycles (Ages 6–9, 10–12, and 13–15).

A total of nine comprehensive lesson plans were developed. The modeling process followed a spiral curriculum approach, where core concepts such as "equipment literacy" and "footwork" are introduced early and revisited with increasing complexity in subsequent cycles. Each unit was structured to include:

1. Instructional Objectives: Specific motor and technical goals.
2. Equipment Prerequisites: Ensuring gear readiness.
3. Risk Management Protocols: Specific safety checks for the teacher.
4. Practical Application: Progressive climbing exercises and games.

The development of this framework adhered to ethical standards for educational research. While the curriculum was developed based on existing literature and expert synthesis, it emphasizes that all practical implementation must be conducted by qualified mentors as defined by Slovenian law. Furthermore, in accordance with modern academic standards, it is disclosed that AI tools

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were utilized for the refinement of text and structural formatting, while all technical content, pedagogical logic, and lesson plan sequences remain the original intellectual work of the author.

By employing this multi-staged descriptive method, the study ensures that the proposed climbing program is both scientifically grounded and practically applicable for PE teachers, transforming theoretical safety concepts into a reproducible educational reality.

Result and Discussion

Result

The results of this study establish a comprehensive pedagogical framework designed to optimize existing climbing infrastructure in primary schools. The findings demonstrate that increasing teacher competence requires a shift from performance-based instruction to a safety-centered Equipment Literacy model. This approach is codified into a structured, nine-unit curriculum designed to facilitate long-term skill acquisition.

A primary finding of the technical analysis is the identification of the Safety Chain as the foundational concept for school-based climbing. To mitigate the 50% competency gap identified in Slovenian PE teachers (Mercina, 2023), the findings suggest that instructional focus must be placed on three technical prerequisites:

1. Visual Recognition: Using the rethreaded figure-eight knot as the standard tie-in method allows for instantaneous visual safety checks by the instructor, even in large group settings.
2. Mechanical Redundancy: The findings advocate for the mandatory use of self-locking belay devices (e.g., Petzl GriGri) in the primary school context. Unlike manual friction devices, these offer a critical secondary brake that compensates for the high-distraction environment typical of extracurricular programs.
3. Risk Isolation: The study finds that top-rope climbing where the rope is pre-anchored is the most effective method for isolation of risk, allowing the student to focus on motor skills while the teacher manages the safety system.

The core output of the research is the development of nine structured lesson plans, divided into three distinct developmental cycles. This structure ensures that students do not merely climb but progress through a systematic acquisition of motor and technical skills.

Cycle I: Foundation (1st–3rd Grade)

The first three lesson plans focus on Wall Familiarization and Vertical Coordination. The findings indicate that at this stage, the emphasis should be on playful lateral movement (traversing) and developing the three-point contact rule. Technical equipment is introduced as a concept, but the focus remains on building confidence and fundamental motor patterns.

Cycle II: Technical Introduction (4th–6th Grade)

In the second cycle, the curriculum introduces the mechanics of the Safety Chain. Students begin to learn the anatomy of the climbing harness and the basic principles of belaying. The research suggests that this age group is capable of understanding the why behind safety checks, making it the ideal phase for introducing equipment literacy in a controlled, top-rope environment.

Cycle III: Autonomy and Advanced Technique (7th–9th Grade)

The final three units focus on Technical Autonomy and advanced movement. Students refine their belaying skills under strict supervision and are introduced to more complex climbing maneuvers, such as flagging and weight shifting. The findings show that by the end of this cycle, students should possess the competence to manage basic safety protocols independently, preparing them for lifelong participation in the sport.

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The core empirical output of this research is the development of a nine-unit progressive curriculum. This model is designed to align with the three-cycle structure of Slovenian primary education, ensuring that the transition from play-based movement to technical autonomy is age-appropriate.

The following table synthesizes the findings into a practical framework for implementation:

Table 1: Structured Pedagogical Framework for School-Based Sport Climbing

Develop-mental Cycle	Target Group (Grades)	Primary Learning Objective	Core Technical Focus (Equipment Literacy)	Sample Practical Activity
Cycle I: Foundation	1st – 3rd Grade (Ages 6–9)	**Vertical Familiarization:** Developing confidence and basic motor coordination on the wall.	Introduction to the "Three-Point Rule"; basic harness fitting and safety awareness.	Horizontal Traverse Tag, focusing on lateral movement and foot placement.
Cycle II: Technical Introduction	4th – 6th Grade (Ages 10–12)	**Safety Chain Mechanics:** Understanding the relationship between climber and belayer.	Mastering the Rethreaded Figure-Eight Knot; partner checks; introduction to Top-Rope setup.	The Safety Check Drill, standardized verbal and visual harness/ knot verification.
Cycle III: Technical Autonomy	7th – 9th Grade (Ages 13–15)	**Operational Competence:** Management of safety protocols and advanced movement.	Use of self-actuating belay devices; advanced belaying techniques; fall management.	Precision Footwork Routes, focusing on silent feet and weight shifting.

The research further identified that teachers require "turn-key" visual aids to implement these findings successfully. Consequently, the study resulted in the creation of a series of technical checklists and visual diagrams (as seen in the accompanying instructional materials) that bridge the gap between complex mountaineering theory and the practical constraints of a 45-to-60-minute school lesson.

By standardizing these nine units and prioritizing the "Safety Chain" through the use of modern equipment, the study provides a replicable solution for transforming underutilized gym walls into active, safe, and professional learning environments. This structured output directly addresses the research objective by providing the precise material needed to facilitate the teacher's work and enhance student safety.

Discussion

The findings of this research underscore a significant disparity between the physical infrastructure available in Slovenian primary schools and the instructional capacity of the teaching staff. While the cultural popularity of sport climbing, bolstered by the global visibility of athletes like Janja Garnbret has led to an influx of climbing walls in gymnasiums, the data from Mercina (2023) and Došler (2018) reveal that over half of physical education (PE) teachers feel unprepared to utilize these facilities. This discussion evaluates how the proposed nine-unit curriculum and the paradigm of "Equipment Literacy" can resolve this institutional challenge within the framework of the Slovenian "Extended School Program."

The Paradigm of Equipment Literacy

The core challenge identified in this study is not a lack of interest, but a lack of technical confidence. For a PE teacher, the transition from teaching standardized sports like basketball or gymnastics to managing a vertical climbing environment is daunting. Traditional gym equipment such as wall bars and ladders requires minimal safety oversight (Möscha, 2008). In contrast, high-wall climbing involves a "Safety Chain" where the integrity of each link (harness, knot, rope, belay device, and anchor) is absolute.

The proposed curriculum addresses this by prioritizing "Equipment Literacy" as a pedagogical prerequisite. By standardizing the "rethreaded

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figure-eight knot," the curriculum provides teachers with a high-visibility safety marker. In a group setting where a teacher may be supervising multiple pairs of students, the ability to perform a "five-point safety check" (harness, knot, carabiner, device, and anchor) in seconds is vital for risk management. This shift from seeing climbing gear as "specialized equipment" to "standardized tools" is the first step in reducing the psychological barrier for instructors.

Technical Innovation: The Role of Self-Actuating Devices

A significant point of discussion is the selection of belay devices. While traditional Slovenian climbing manuals (e.g., Simonič, 2003; Guček, 2011) often emphasize manual friction devices (such as the "ATC" or "Sticht plate") for their simplicity, this research advocates for the mandatory use of self-actuating or "active braking" devices like the Petzl GriGri in the primary school environment.

The rationale for this is rooted in the specific stressors of the school gymnasium. Unlike a commercial climbing gym where one-on-one instruction is common, a PE teacher in an extracurricular setting must manage large groups. Self-actuating devices provide a mechanical backup that significantly reduces the risk of human error if a student belayer becomes distracted or loses their grip on the brake strand. By integrating these devices into Cycle III of the curriculum, we ensure that students transition to autonomy with a safety buffer that reflects modern industry standards. This technical choice directly supports the teacher's ability to maintain a safe environment while managing a larger class size.

Pedagogical Progression and the "Extended School Program"

The Slovenian legislative framework for "extended programs" (Komljanc et al., 2007) provides the ideal structural home for this curriculum. Because extracurricular activities are voluntary, they attract students with a genuine interest in the sport, which facilitates a higher quality of instruction. The discussion emphasizes that climbing should not be viewed merely as a physical workout but as a holistic developmental tool.

As noted by Kolar (2011), extracurricular activities help students develop self-esteem and social values. In climbing, this is achieved through the "Belayer-Climber" relationship. The curriculum's emphasis on "Partner Checks" in Cycle II fosters a culture of mutual trust and responsibility. When a student holds the life of their peer in their hands (under teacher supervision), the educational outcome transcends motor skills; it becomes a lesson in ethical responsibility and social cohesion. This aligns with the "advisory role" of the mentor highlighted in earlier Slovenian pedagogical theory (Kolar, 2008), where the teacher guides the student toward technical autonomy.

Physical Development vs Institutional Safety

While the motor benefits of climbing such as coordination, flexibility, and arm/shoulder strength, are well-documented (Möscha, 2008; Pistotnik, 2017), the discussion must address the liability concerns that often hinder these activities. The underutilization of climbing walls is often a defensive measure by school administrations wary of accidents.

By implementing the nine-unit curriculum, schools move from "unstructured play" to "systematic skill acquisition." The use of "Top-Rope" climbing as the foundational method is a critical finding in this regard. Top-roping eliminates the possibility of a "lead fall," keeping the climber securely attached to an overhead anchor at all times. This method is the safest way to introduce children to height, allowing them to focus on movement patterns such as the "three-

point contact" rule without the fear of a significant drop. This systematic approach provides school administrators with a clear safety protocol that can be documented and insured, further encouraging the activation of unused walls.

The success of Janja Garnbret has created a "pull" factor where students are demanding climbing content. However, the "push" factors the supply of trained teachers has lagged behind. This research suggests that the solution is not necessarily to turn every PE teacher into a professional mountain guide, but to provide them with specialized "School Climbing" certifications based on the nine units presented here.

Future research should focus on the efficacy of these lesson plans in diverse school environments. While the current curriculum is designed for primary schools with high walls, adaptations may be needed for schools that only have "bouldering" (low-level) walls. Furthermore, the integration of digital visual aids such as the diagrams of the safety chain developed in this study could serve as a permanent instructional fixture in gymnasiums, providing a visual reminder of safety protocols for both teachers and students.

The synthesis of the technical, pedagogical, and legislative aspects of climbing education leads to a clear conclusion: the "competency gap" is a solvable problem of resources, not a lack of potential. By standardizing equipment (self-locking devices), methods (top-rope), and progression (the nine units), we can ensure that Slovenian school gymnasiums are not just rooms with walls, but centers for modern physical literacy.

This research provides the bridge between the infrastructure provided by the state and the educational needs of the students. It transforms a high-risk activity into a managed educational experience that builds physical strength, psychological resilience, and a lifelong passion for sport.

The rapid expansion of sport climbing infrastructure within Slovenian primary schools represents a significant opportunity for enhancing youth physical literacy. However, as this research has demonstrated, the presence of climbing walls does not inherently translate into educational value without a corresponding increase in teacher competence. This study successfully addressed this institutional gap by developing a structured, nine-unit pedagogical framework designed to transform underutilized facilities into safe and effective learning environments.

The primary contribution of this research is the transition from a performance-oriented climbing model to an "Equipment Literacy" paradigm. By focusing on the "Safety Chain" and the standardization of technical protocols specifically the use of self-actuating belay devices and top-rope configurations, this study provides a realistic solution for physical education (PE) teachers who previously felt unprepared to manage high-wall activities. The systematic division of the curriculum into three developmental cycles ensures that climbing is introduced not as a high-risk adventure, but as a disciplined, age-appropriate athletic pursuit that fosters trust, responsibility, and physical coordination.

Furthermore, the integration of these findings into the "Extended School Program" aligns with the modern objectives of Slovenian educational policy, which seeks to provide holistic and voluntary learning opportunities that complement the mandatory curriculum. The lesson plans developed herein serve as a "turn-key" resource, bridging the gap between complex mountaineering theory and the practical constraints of a 45-minute school session.

Ultimately, this research concludes that the activation of school climbing walls is a critical step in fostering a sustainable culture of sports engagement. By empowering teachers with structured instructional materials and a safety-first methodology, schools can ensure that the "Garnbret effect" results in a meaningful, long-

term impact on the physical and social development of the next generation. Future efforts should focus on the institutional adoption of these units within teacher training seminars to ensure that every climbing wall in Slovenia serves its intended purpose as a hub for student growth and physical excellence.

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Declarations

Author Contribution Statement

AU and **BJ** conceived and designed the research framework. **AU** conducted the literature analysis and developed the pedagogical lesson plans. BJ provided technical expertise on safety protocols and equipment literacy. **AU** drafted the manuscript, and **BJ** critically revised the content for technical accuracy. Both authors have read and approved the final version of the manuscript.

AI Disclosure Statement

The authors used Gemini and Chat GPT during the preparation of this work to assist in structural formatting, linguistic refinement, and the synthesis of reviewer feedback. After using the tool, the authors thoroughly reviewed and edited the content to ensure technical and pedagogical accuracy and take full responsibility for the content of the publication. The authors declare that the core research logic, curricular design, and technical climbing protocols were prepared and researched without the aid of artificial intelligence techniques.

Conflicts of Interest

The authors confirm the presence or absence of any potential conflicts of interest such as financial, institutional, or personal that could influence the conduct of this study, the analysis of data, the preparation of the manuscript, or its publication.

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