



## Inductive and Deductive Reasoning in Sports and Exercise Coaching Process: A Systematic Review

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Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

DOI: 10.17309/jltm.2023.2.03

### Abstract

**Background.** Skill acquisition in teaching a new physical exercise skill is quite similar in process to other skill-learning in general. In teaching physical exercise techniques, two teaching and learning approaches can be used. Most often instructors used the deductive method in teaching exercise techniques. But in a real-life setup, it is quite common to hear athletes learn exercise techniques on their own self, with limited guidance or exposure to proper steps or techniques (inductively).

**The aim of the study.** This study aimed at identifying the actual number of studies that have been conducted and/or compared the usage of deductive and inductive teaching approaches in teaching exercises or sports skills.

**Materials and methods.** This systematic review used PRISMA guidelines to locate related literature. Eligible papers were evaluated for integrity, and relevant findings were combined to enable thematic analysis.

**Results.** Twenty-six studies have actually fulfilled the requirements standards and were selected for review and analysis. In total, 1430 participants participated in those selected studies. Except for four studies, other studies have been found to have a low risk of bias, which indicated the research to be more accurate. This review showed that most of the instructors (teachers, coaches) prefer to use the inductive method. Five studies used the inductive method and three studies used the deductive method directly. The other 18 studies used the deductive and inductive methods indirectly or combined with other approaches. The inductive approach method was more effective according to the results.

**Conclusion.** The inductive method for teaching exercise skills is said to be more preferred mainly due to a good response received from the students in the majority of the studies, and considered more effective for teaching a new exercise or sports skills. The deductive method has not been totally sidelined but it is less preferred.

**Keywords:** deductive and inductive teaching.

### Introduction

Deductive reasoning is the process of making logical inferences. It is only one kind of logic. Because deductive reasoning issues are a key cognitive function and an essential component of intelligence, they are included in IQ testing. Those with higher IQs are better at generating conclusions, which is the cornerstone of reasoning. A valid deduction is one whose conclusion is true in any scenario when all of its premises are true, according to logicians (Wahl-Alexander,

& Curtner-Smith, 2019; Atjonen, Pöntinen, Kontkanen, & Ruotsalainen, 2022). Inductive reasoning is used when generating predictions about unfamiliar circumstances based on previously known information. Probabilistic forecasts are required. Much of the common thinking that people perform may be compared to induction. There is some kind of induction involved in all predictions, including the possibility that it will rain today as well as if market prices will rise over the next six months. A broader range of cognitive functions such as classification, probability estimation, analogy, scientific inference, and decision-making, all entail induction (Bravo, & Gámez, 2021).

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Video provides an objective record of performance, and intricacies of a motion that are tough for instructors to observe in real-time may be discovered on a replay. The coach might persuade the athlete about certain parts of the performance using pictures of the performance. After watching and reviewing the video, the athlete and coach should have the same opinion of the performance. Many people are visual learners. Although the coach may rectify mistakes made by players during a game, some players may not realize it. On the other hand, showing a video of the same error may speed up their learning (Derakhshi, Rezaii, Razavi, & Sarfaraz, 2016).

In the meantime, some people believe that the unexpected and rapid switch to online education during COVID-19 would lead to a negative user experience incompatibility with continuous development. Others predict a new hybrid educational paradigm will emerge with tremendous benefits. This proves that online education can be more productive in a number of ways. Referring to multiple studies, learners gain 25-60% more knowledge when they are doing online learning compared to only 8-10% in a classroom. This is mostly related to the fact that students may be educated more quickly online. Due to the fact that students may study at their own speed by re-reading, skipping, or moving swiftly through courses, e-learning enables learning that takes 40-60% less time than traditional classroom instruction (Dinuta, 2013; Frederiksen, Cooner, & Stevenson, 2012).

Along with the flipped classroom trend, “blended learning” became more and more well-liked. Obstacles relating to location, timing and environment are removed by this type of command. Additionally, it enables direct interaction between educators and learners. In contrast to flipped classrooms, blended learning is a type of online education that enables simultaneous live communication between both parties. The educator may keep an eye on group discussions, idea exchange and exercises (Gaona, Castro, & Palikara, 2020).

Throughout time that most researchers concur that using video technology for teachers’ learning has many benefits (González-Calvo & Fernández-Balboa, 2018), however, there are also drawbacks, such as “attentional biases” (viewers pay attention to just particular elements of classroom interactions) or “the possibility for cognitive overload”. These concerns also apply to live coaching observations too, and video learning can assist resolve such issues (Higgins et al., 2011; Hilland et al., 2018).

### Rationale

Many studies used the deductive and inductive approaches in life or teaching skills but not on sports exercises coaching.

### Objective

This study aimed at identifying the actual number of studies on the deductive and inductive teaching approaches in sports exercises.

### Materials and methods

Studies were considered acceptable for inclusion if they matched the following requirements: (1) used both deduc-

tive and inductive approaches in teaching. (2) used human participants as subjects. (3) were published between (2007-2022). (4) only published in the English language.

### Information Source

For this systematic review, the source of articles was lens.org

### Search Strategy

This literature review adhered to the chosen reporting items for systematic reviews and Meta-Analyses (PRISMA) guidelines. In Figure 1 we showed the PRISMA-based articles review process and illustrate each step of the literature search and study selection process. The database (Lens.org) was carefully and systematically looked for scholarly publications relating to deductive and inductive teaching. All papers were also found by hand searching and studying the citations of those who matched the qualifying requirements. The search involved two stages (table 1). In the first stage, the search strings focused on deductive and inductive approaches. The second stage focused only on the deductive and inductive approaches in teaching sports exercises. The database search captured 226 non-duplicate articles with a total of 26 articles meeting the qualifying requirements for inclusion.

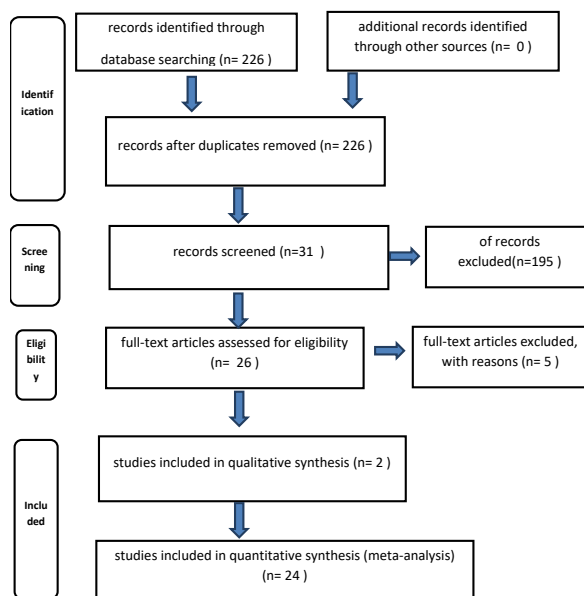


Fig. 1. PRISMA flow chart of the literature search and study selection

### Selection Process

Articles were included in the literature review if they were: (1) published between (2007-2022), (2) contained texts that state deductive and inductive teaching. (3) used human samples. Articles were excluded if they were (1) from any source other than the mentioned source that has been used, (2) published in any language except the English language, (3) did not contain deductive and inductive teaching text, (4) did not use the deductive and inductive method in teaching, (5) the full text could not be found.

**Table 1** characteristics and findings of studies included in the review

No.	Study	Subjects (sex and mean±SD age, height and mass)	Methodology (measurements)	Results	Conclusion/Suggestion
1.	Strategy models in learning of Islamic education in essentialism philosophy perspective	Collected data and Information on library materials relevant to research object	Documentary approach, which collects data and information about library materials related to the study purpose. Data analysis using the deductive and inductive methods.	The Islamic educational learning method is a conceptual framework that guides educational designers and practitioners. Models of student-centered learning, such as cooperative, contextual, and active learning, are used. According to the essentialism school of thought in education, education must be deeply founded in traditional cultural values and historical legacies that have been proven to perpetuate virtue.	1. Learning strategy Islamic religious education is a conceptual approach designed to aid educational designers and practitioners, notably teachers, in planning and implementing effective and efficient Islamic education classes. 2. Essentialism is a school of thinking in education. The idea claims education should be built on a firm basis that cannot be readily rocked. 3. From the standpoint of essentialism, Islamic educational learning strategy models are teacher-centered learning methods.
2.	Using formative research to develop CHANGE!: a curriculum-based physical activity promoting intervention	60 youngsters aged 9 to 10 years old (24 boys, 36 girls). 33 parents (four men and 29 women) and ten instructors (4 male, 6 female).	Interview questions were organized, and all data was recorded verbatim. Deductively, pen profiles were created from the transcripts.	Despite some children's misunderstanding of what defines physical exercise, tests found that people comprehend the link between exercise and good health. Children and their parents frequently agreed on their points of view.	For knowledge, practices, and attitudes toward physical exercise, group interviews indicated consistent trends across socioeconomic groups and gender. Based on these findings, aspects of the intervention can be changed based on local requirements and resources.
3.	Organisational Stressors, Coping, and Coping Effectiveness: A Longitudinal Study with an Elite Coach	40-year-old male elite head coach of an aquatic sport	There were three parts in the daily diary. First, the participant utilized an open approach to write out the organizational pressures he had experienced as head coach that day. Fletcher et al. provided a description of organizational pressures before moving on to this section. Second, the participant stated, in an open-ended way, what he has done to handle each of the organizational pressures experienced. Third, Nicholls et al. developed a 10-point Likert-type scale.	28 daily diary sheets were done, the subject revealed a total of 66 organizational stressors and 70 coping strategies. Stressors were classified as one of 33 first-order themes, 13 second-order themes, or four basic dimensions. For coping Styles, 25 first-order motifs, 14 second-order themes, and three generic dimensions were identified.	Retrospective recollections have been utilized in research on organizational pressures and coping among coaches. The current study used daily diaries to overcome the limitations of this technique. The findings revealed common organizational pressures and coping mechanisms that tended to change through time. The nature of higher-order coping reactions, on the other hand, remained largely consistent during the 28-day period. Furthermore, key coping techniques were linked to commonly encountered stresses, and coping efficacy tended to deteriorate with time.
4.	Origins of perceived physical education ability and worth among English adolescents	Fifty-three physical education students (42 girls) aged 12-14 years (mean .¼13.18)	Instructors were asked to rate their pupils on a three-point Likert scale centered on below-average performance and above-average performance based on key stage 3 accomplishment targets, which require students to know, apply, and grasp the subject matter.	Comment from outside sources (n ¼38), views of incompetence (n ¼31), and compared with peers (n ¼15) are the three higher-level themes. External input focused on lower-level issues such as instructors, classmates, honors, and accomplishments. Higher-order topics include PE instructors (n ¼52), the physical encounter of PE (n ¼29), and the expectancy-value link (n ¼21). All three higher-order themes included both positive and negative lower-order themes.	The research concentrates on the perspectives of individual learners on the importance of and aptitude for physical education; focus groups were used to reach a consensus that will guide class-level intervention. The focus group interviews comprised students with low, average, and high ability levels, allowing the researchers to investigate the foundations of viewed PE worth and ability across a wide range of students.
5.	Sources, topics and use of knowledge by coaches	Coaches (N = 320)	The questionnaire was first emailed to the two writers' existing networks of sports coaches and keepers. Replies to each item were diverted to different Microsoft Excel 2010 files for additional investigation. Responses to questions were examined as a standalone meaning unless they have more than one self-definable point.	The findings demonstrated that coaches preferred and largely obtained coaching information via informal learning activities, particularly when they allowed for social contact. Notably, authorized trainer education courses came up regularly as a source of current knowledge improvement. Nonetheless, there was little critical reasoning for and use of gained information.	There was little self-reported proof of critical reasoning for and implementation of this information. While we recognize that the existing study's survey strategy made asking pointed questions about clear and specific evidence difficult, we truly think we are rational in proposing that instructors approach new knowledge in a fewer than optimal manner, particularly by being incompletely critical and too detailed. For example, rather than being a generic rule, the last item coaches taught was typically applied immediately and explicitly.

6.	The views and aspirations of young people with autism spectrum disorders and their provision in the new Education Health and Care plans in England	12 children with autism spectrum disorders.	The perspectives were gathered from the education, health, and care plans. Through content analysis, these plans were studied inductively and deductively, with the international classification of functioning, health and disability, children and youth version serving as a coding framework.	There were disparities in how young people with ASD were asked to speak throughout the plans. There were 189 functional codes in all, with activities and participation codes being the most often used to indicate their points of view. Body functions were followed by environmental conditions.	The biopsychosocial model of function and health, as well as the new English strategy, are used to analyze these discrepancies. The implications of using the international classification of functioning framework to offer a voice to youthful people with autism spectrum disorders are also highlighted.
7.	A qualitative analysis of the factors determining the quality of relations between a novice physical education teacher and his students' families: implications for the development of professional identity	A novice PE teacher	The teacher was requested to investigate his subjective authorization as a PE instructor. He accomplished this by producing a thorough personal autobiography that, in addition to conveying the primary etymological roots and motivations for choosing to teach PE.	The findings, which are given in two halves, reveal two unique sets of qualities that had quite different ramifications for how the teacher's professionalism developed. On the one hand, there are 11 unique "struggle variables" to consider (six socio-cultural and structural factors and five family prejudices against physical education) that emerged during the first three years of teaching, jeopardizing the teacher's initial pedagogical passion and causing considerable hesitation and discouragement.	This study contributed to the discovery of 11 failure variables and 8 major success variables that influenced participant teacher-family interactions and professional identity. Six of the initial failure factors were sociocultural issues, and five were family attitudes against physical education. Only one of the success criteria was provided by the kids' families, while the remaining seven were provided by the instructor.
8.	Learning to teach sport education: investigating a pre-service teacher's knowledge development	One male (age 23 at graduation from the program)	The study investigated a PST's continuous learning to teach SE as part of a PETE program and while teaching during the school placement component of the PETE program using the three-level model of learning as a framework.	Based on the findings, the PST gained a more conscious knowledge and practice of learning and teaching SE. As a result of the whole learning process, the PST developed a notion of educating and training SE that paralleled understanding at an intuitive level.	As a result of the all-encompassing learning experience, the subject obtained an understanding of teaching and learning that extends beyond understanding how to teach SE, according to the findings of this study. SE provided him with a tool to assist him to understand and apply the practice. on an abstract level so that he could grasp theory through experience.
9.	Unpacking productive coaching interactions: identifying coaching approaches that support instructional uptake	Four coaches and five teachers.	A number of 17 training sessions were filmed. Training sessions lasted approximately 38 minutes and were videotaped in their entirety. Lessons were videotaped in the week after each coaching session. Inductive and deductive analyses were employed in tandem. Across (a), coaching interaction speech is coded. (b) detecting and grading uptake and quality. (c) investigating trends within and between cases.	The acts of the teachers in each of the partitions were obviously consistent with recent proof of the link between educators' transformation agency and teacher agency. These coaches, whether on purpose or not, framed their discourse in such a way that educators with varying needs and attitudes regarding being trained were placed to be agentive. Instructors did not 'give' or 'push' agentive conduct, rather, they cleared a path for teachers to adopt it by using their Talk skillfully.	Four activities in the dialogue - expanding the space through interviews and proclamations, trying to seek additional elaboration, observing and mentioning the current instructing behaviors as the foundation for new or refined behaviors, and delivering expansion of tactical pedagogical content knowledge - appeared to lay the groundwork for an equal and fair coach/teacher connection and could be a great starting point forward into clarifying the comprehension skills which underpins constructive instruction.
10.	Assessing Teacher Dispositions In Pre-Service Teachers	Graduate students (N=44)	the Teacher Disposition Index (TDI) was employed. The instrument's reliability and validity were assessed. The TDI researchers intended to look into shared variance in order to figure out how many dimensions the TDI monitored. The TDI measured two variables, according to the researchers: a "Student-Centered" aspect and a "Professionalism, Curriculum-Centered" dimension.	Seven of the 45 items in the TDI were found to have statistically significant variations when assessed over time. Seven of the ten INTASC values showed substantial variations in development over time, namely principles 4, 7, and 9, which were corroborated by interpretations supplied by focus group members.	Teacher dispositions are critical characteristics in producing and assessing exceptional educators. Agencies that certify trainer's education, such as INTASC, TEAC, and NCATE, have taken the study clearly. These organizations expect instructors to have the "knowledge, abilities, and attitudes" required for success.

11. Family context in the learning of high school students	116 between parents and students of middle school	Analytical, Inductive, synthetic, deductive, and statistical methods were appreciated in the research. The inductive technique attempts to examine the phenomena under investigation from the general to the specific; the deductive method obtains answers directly and without intermediaries. The analytical method allowed for the objective and real description of the fact under study, as well as the explanation of the causes that determine it, in what was used in the investigation results in the pedagogical accompaniment; the synthetic method is directly related to the study specifications and was used to detail the summary of the research, the introduction, and the conclusions.	learning by presenting a model of change in the educational sector, taking into account the students' existing knowledge.	well recognized that the family impacts the learning process, therefore it must be built from the start. Within the family, in order for this to be reflected favorably in society.
12. The teaching of natural sciences in the demonstration of experimental tasks in the upper basic	Upper basic university students at the Chone canton's Gil Alberto Rivadeneira Arteaga Educational Unit on the 3 Maras campus	The employed methods were inductive-deductive and experimental, with the interview being the most suitable methodology. The narrative level was used to describe the reality that was observed at the institution and so assess the degree of severity of the problem highlighted.	According to the study findings, the home environment in which secondary school students study must be investigated in order to improve teaching-learning and take into consideration the knowledge that already exists in the student's working memory. Despite the fact that the instructor used his cognitive experience to lead and regulate the activities in the school lab, the class research was not deepened, and the executor, the student, did not control the activity when the development of theories and practices was noticed in accordance with regard to comprehension of the material.	Natural science instruction is the practical and experimental criteria of learning from the earliest years, establishing the foundation required for pupils to begin with acceptable knowledge at the level studied. Natural science education impacts upper-basic students' display of research processes based on laboratory practices and classroom experiments.
13. Information and Communication Technologies, Their Impact on the Teaching-Learning Process	18 teachers	The qualitative technique was used to research the depth levels of the teaching process, and the inductive-deductive method was used to derive the behavior of this methodology and its occurrence in education from what was studied.	94% of the instructors polled indicated they use creative techniques in the educational process, such as learning with technology tools, while 6% said they don't. The adoption of new technology as an educational instrument to achieve the fulfillment of activities in teaching-learning, and managing to build new information and meaningful experiences for the student, is an example of teacher innovation.	Technology for information and communication is prevalent in every human activity, particularly in the educational sphere. Teachers are aware that different learning strategies must be recognized and utilized based on the student's circumstances during the teaching-learning process.
14. Prezi as an Innovative Teaching Tool for the Strengthening of Significant Learning	200 teachers	This study's methodology is inductive, deductive, and descriptive, letting it reflect the current state of learning growth.	76% of educators stated that the usage of innovation is frequently required for valuable training, and 30% of surveyed students stated that they use PowerPoint in-class activities; thus, it is clear that the application of the Prezi is a creative proposal with an orderly, creative, and a presentation that is interactive for the accomplishment of learning.	The use of technology and innovation has the goal of transforming classic practices, developing creative and constructive understanding in the realization of a task while taking into account the information and communications tools linked to the Prezi itself, which will build skills and dexterity in the realm of this presentation software that helps improve the learning experience, such as challenges of a complex virtual world.

15. Experimental Equipment to Develop Teaching of the Concept Viscosity	One hundred students between 19 and 25 years old.	Using deductive approaches, the professor teaches ideas, principles, theorems, and/or equations in a short amount of time (often two or three hours), while the student must extract various conclusions and absorb the topics presented by the professor. After the theory has been presented, the students do experimental activities. During these sessions, students can use commercial viscometers to test the theoretical concepts learned in class.	The establishment of the given approach allowed for the characterization of the various tested fluids. It aided pupils in comprehending fluid behavior based on its type and velocity. In each fluid, the minimum produced tests were fifty-four (minimum six tests with three repetitions at each tested temperature). The water temperatures examined were 19.40 _c, 29.75 _c, and 40.45 _c. Sixty-three tests were performed on the ketchup, with the tested temperatures being 29.50 _c, 40.50 _c, and 46.15 _c.	The growth of this didactical experience resulted in two excellent outcomes. On the one hand, the pupils practiced teamwork's transversal competencies. With the guidance of the lecturers, they practiced thinking, devised specialized instruments, and constructed the viscometer. This design was developed to assist teachers in rethinking how to teach the first unit of fluid mechanics subject.
16. In Enhancing Preservice Teachers' Assessment Literacy: Focus on Knowledge Base, Conceptions of Assessment, and Teacher Learning	(N = 168)	Five 90-minute seminars focused on preparing and modeling a teaching tool for a blended learning environment, with the added necessity of planning and discussing it from an evaluation standpoint. Students were randomly assigned to peer groups of four to five people from various academic programs. The groups collaborated to create a teaching tool, and each student kept an open journal of their personal comments on the evaluation and conversations in the Interdisciplinary peer group.	Since all statements (f = 449) of the knowledge evaluation Base (kb) were tallied, it was built to depict Student instructors' reflections on seven elements based on xu and brown's Talip model (2016). The students commented on evaluation techniques and responsibility the most (16 + 16% of the utterances) and the least (1 + 2 + 3% of the utterances).	Pste experiments do not have to be expensive in order to expose future educators to the many pedagogical inputs and outputs of assessment. This is consistent with our prior observations of the same unit where the evaluation module described in this study was completed.
17. Identification of Parameters That Predict Sport Climbing Performance	Ten expert climbers male (Mage = 28, SD = 6.6 years)	to stand in for experienced climbers with climbing certificates for coaches, a purposive sample was used. Criteria for inclusion were (a) domain-specific measures of individual climbing ability and (b) officially controlled awards that demonstrated Sport climbing coaching education. On the one hand, interviewees had to have advanced to elite current climbing skill levels that were preferable to an on-sight 7a French Rating Scale of Difficulty.	Overcoming stumbling blocks, strength and conditioning factors, connection with the surroundings, a diverse repertoire of climbing motions, risk management, mental balance, route management, peer communication, and route preview was revealed as the climbers' most significant performance characteristics. When it comes to physical and emotional preparation and preparing ascents, route previewing has emerged as crucial. This is when optimizing the path progression of decision-making (ascent strategy forecasting) and improving route commitment strategic management play a role. (ascent effort forecasting).	All the findings provide a preliminary foundation for creating and conducting training programs to improve indoor climbing performance. A wide range of climbing performance parameters was connected to improved climbing performance. The significance of route previewing, as discovered in prior research, was validated. Important performance measurements may be neglected since existing programs are usually built on an as-needed basis.
18. 'Let Them Get on With It': Coaches' Perceptions of Their Roles and Coaching Practices During Olympic and Paralympic Games	8 coaches, 7 male and one female (46 to 72 years)	It was decided to create a semi-structured interview guide. The discussion format was divided into two halves, and coaches were urged to concentrate on their Olympic and Paralympic expertise throughout. The first phase included introduction questions regarding the coaches' background and experience and participants were encouraged to speak descriptively. The second section of the interview protocol concentrated on coaches' views on their responsibilities and coaching processes throughout the tournament.	The data revealed six higher-level themes. During important tournaments, coaches' perspectives of their duties and coaching procedures are represented. These were the following themes: Supportive environment for athletes, planning and preparation watching, analysis, and action, athlete psychological preparation, management and coach psychological preparation. The number of coaches whose replies correspond to each higher and lower-order topic is listed next to each of the higher-order and lower-order themes.	The coaches underlined that the tournament was an opportunity to "let the athletes do their thing, adding that all of the work had been completed prior to the tournament, with just minimum input, if any, required. The findings provide early evidence for coaching as competitive orchestration. with the coaches seeming to be the orchestrators. More study is needed to determine who drives the Process and how, as well as if this changes as players acquire expertise.

19. Seeking the General Explanation: A Test of Inductive Activities for Learning and Transfer	103 undergraduate engineering students	A 2_2 between-subjects design was employed in the study, which combined the approach to teaching (hd vs. Id) with the assessment instrument (mt vs. Nomt). Sections were given one of four conditions at random. Because of section enrollment of each condition had a different number of students: hd-mt (3 sections, 20 students), id-mt (3 sections, 20 students), hdnomt(2 sections, 15 students), and id-nomt (3 sections, 20 students) (3 sections, 25 students).	There were no changes in midterm results according to the approach to teaching, $f(1,73) \frac{1}{4}0.17, p\frac{1}{4}0.68$ . There was a marginal difference by measuring instrument, $f(1,73) \frac{1}{4}3.30$ , but the measurement tool had no main influence on worksheet explanations. In the mt condition, 20% of students identified the deep structure in their explanations, compared to 18% in the nomt condition. In the id condition, a somewhat greater number of students indicated the deep structure while using the measuring tool, 36% mt vs. 29% nomt. This distinction was not statistically significant, $\chi^2(1, n\frac{1}{4}08)140.08, p\frac{1}{4}0.78$ .	In two investigations, college students participated in an inductive exercise based on Bacon's scientific generalization tenets. The experiments show that well-designed inductive instruction may be used to acquire topical knowledge as part of generating generalizable theory from evidence. Several unique contributions need attention. We discovered that this inductive effort resulted in increased student success in determining the deep structure of the phenomena, which is associated with subsequent performance on unique but related tasks.
20. Didactic Strategies Used in Teaching - Learning of Premathematical Operations in Preschool Education	Last kindergarten year children	Intervention is required in a certain sequence as a series of activities and processes arranged into a specific game form and inside the mathematical ideas; the mathematical material appears as an exercise or as a problem situation.	The kid gains a skill by action that is repeated, intentionally, and systematically, and employing it in different situations transforms learning into skill. Abilities and gained skills in pre-mathematical operation method, exercised through Exercises in mathematical activities, lead to automat and internalization, progressively transforming them into skills. Pre-mathematical procedures based on specific material exercises.	The establishment of intellectual pre-mathematical processes inside mathematical activities is critical to approaching mathematical topics in preschool education. The exact pedagogic tactics utilized in the teaching and learning process must assist the youngster to get a better knowledge of hard mathematical issues.
21. Knowledge construction by users. A content analysis framework and a knowledge construction process model for virtual product user communities	Samples of threads from Dell Support Forum (English)	The paper is based on a deductive and qualitative analysis of conversation threads from a variety of virtual product user groups about fixing technical challenges. To enhance the data, a thematic analysis of interviews with site users is used.	"Knowledge construction episodes" are divided into five subcategories that are directly related to the creation of new knowledge to address technical issues and difficulties, which are the important bricks in the production of new knowledge. Issue description events were discovered to aid knowledge development by giving details on the issue and its context. They serve as a facilitator rather than a participant in the main conversation (knowledge-building) process.	The analytic approach suggested in this study captures significant elements of knowledge behaviors in situations where critical thinking is not required, and it may be utilized to explore not just virtual product user communities, but also other related contexts. People engage in these activities in their daily lives and at work, but they have gotten less emphasis than knowledge development in formal learning circumstances. The framework might be used to enhance existing CSCL analytical frameworks and methodologies for studying high-level cognitive development and critical thinking.
22. The Classroom Discourse Observation Protocol (CDOP): A quantitative method for characterizing teacher discourse moves in undergraduate STEM learning environments	biology lecturers (n = 13, 37 class sessions)	Researchers assessed thirteen faculty members at a large midwestern research-intensive institution in the United States who were mostly teaching introductory undergrad biology courses (majors and non-majors) in active learning environments (ales). Ales are distinguished by the three main components: 1) ales, which are learning spaces in which the pupil is heavily engaged and the sites have been crafted for increasing learners interactions with classmates and instructors. 2) administration that emphasizes communication and interaction Instruction and opposes the usage of traditional lectures exclusively. and 3) faculty development in evidence-based science teaching approaches. Twelve of the thirteen instructors we investigated taught in ALCS, with one teaching in a standard lecture class with theater-style seats.	Unlike student-centered initiatives, teacher-centric tdm in the cdop, focus on instructor actions. We can witness the teacher evaluating student replies by mirroring the student's words. When a teacher, accepts, rejects or repeats a student's response, or simply confesses they do not know the answer to a student's request, this is an assessing move. This discourse maneuver is used to check student comprehension of a subject or to validate the accuracy of their response.	The current work described the creation and validation of a tool, the Class Discourse Observation Protocol (cdop), that accurately measures teacher discourse movements (tdms) in undergraduate stem learning contexts. Tdms are crucial components of academic learning, especially in active learning situations where student-teacher interactions are increased.

23. Identification of Relationship between the Use of Mobile-based Virtual Social Networks and Critical Thinking Skills	100 university students	In this investigation, the statistical analysis application SPSS version 16 was employed to evaluate the study hypotheses. To compare the averages of more than two groups, the ANOVA test, one-way ANOVA, was employed, and the post-test was utilized to assess the difference between the groups. A survey is meant to assess critical thinking with respect to the dependent variable.	Six kids were among the 100 that took part in the study. Group 1 got to spend less than one hour each week on simulation model internet communities depending on the use of cell phones, including 24 (24%); Group 2 spent one or two hours per week on mobile-based virtual social networks, including 30 (30%); Group 3 spent two to three hours per week on virtual mobile social networks, including 16 (16%); and Group 4 spent three to five hours per week on them to participate in mobile social networks, including 16 (16%).	The results of the Comparative Effectiveness Analysis are not consistent. The far more effective learning paired with a face-to-face approach on increasing creativity, critical fluid elements of thinking, expansion, invention, analysis, and understanding, but there is no significant difference between instruction mixed with flexibility training and evaluation components. The results of this research were inconsistent in describing the aspects of analysis, which can be carried out due to his position as a test and their effect on each other Students' learning critical thinking, study of the students, and while doing It had nothing to do with teachers or students.
24. Learner-Centered Management Education: A study of Inductive Teaching and Learning Methods	50 management and engineering students and lecturers Secondary data: information's are collected from books and different websites.	Questionnaire survey and personal interview.	The majority of educators believe that the inquiry style of teaching is the easiest of the inductive techniques and may be the ideal place to start for untrained or previously conventional instructors. This strategy necessitates the planning of education in such a way that as much learning as possible occurs in the context of responding to questions and solving problems. The majority of people believe that experimental projects should be included in project-based learning. However, the time necessary for planning and participation in this strategy is minimal. This technique is particularly suited to engineering design courses and laboratory courses that are more than collections of cookbook experiments; it may also be utilized in other courses dealing with a process or product design and development.	Learner engagement and involvement are addressed by the learner-centered teaching technique. However, the research contributes significantly to the future by taking a stimulating and engaged approach to the problem of learning. However, just using an inductive technique may not result in improved learning and more pleased pupils. Inductive teaching, like any other style of education, may be done in a methodical fashion, and the consequences are only as excellent as the knowledge and care to which it is applied.
25. Exemplification in Science Instruction: Teaching and Learning Through Examples	75 undergraduate students 3rd-year in their early twenties	This exploratory essay relies heavily on descriptive analysis (video records, quizzes, and interviews) that are processed inductively to create a natural picture of a school science lecturer's explanation strategies within class instruction. Using this methodological strategy, we were able to undertake an in-depth assessment of students' experiences learning from scientific examples without interfering with the biology instructor's existing practices.	In the sense that a scientific argument was ultimately made in favor of a larger generalization (claim) based on a fundamental similarity across multiple dissimilar instances, the pattern of biological cases described in this session was coherent with an argumentative sequence known as inductive reasoning by parallel cases (monahan, 2015).	Students can use example-based validation tools or prompts to indicate that they have learned how to apply a previously taught subject or concept. This is particularly obvious in works on scientific teaching practices, which commonly provide examples at the application level of Bloom's (1956) taxonomy. Exemplification extends beyond the deductive application of general principles to specific instances; it may also be utilized inductively to teach science concepts to pupils.
26. Influence of Negotiations on Preservice Teachers' Instruction Within the Skill Themes Approach Unit	Nine preservice instructors. Kindergarten students (n = 203).	Data was gathered by nonparticipant observation, informal interviews, critical event reflections, document analysis, and formal interviews. Deductive and inductive qualitative techniques were utilized to classify and categorize the data.	A distinct and mostly favorable negotiating pattern arose, as did numerous different types of conversation. Learners were also taught how to have difficult talks in order to change information that they perceived to be gender discriminatory.	The results might be used to educate preservice teachers on how to communicate more successfully while teaching using skill themes.

**Data Collection Process**

The first phase search was done from 20th November 2022 to 1st December 2022 during 9am-5pm office hours on lens.org database using only one keyword, “deductive inductive learning”. The database studies were acquired, and the titles and abstracts were originally evaluated by a single researcher. The same researcher independently evaluated the full-text copies of papers that passed the initial screening procedure. The second researcher (supervisor) was consulted when a consensus decision about the eligibility of articles. Each paper was read to gather the following details concerning deductive and inductive teaching, which was then collated into a table using Microsoft Word (table 1). The table gives a clear perspective of similar characteristics and traits, as well as a summary of some surprising results. The data field is in line with the aim of this review and included: (1) study title, (2) subject information, (3) methodology, (4) results, (5) Conclusion/Suggestions.

**Study Risk of Bias Assessment**

The Cochrane Collaboration tool (Higgins, 2011) has been used to state the risk of bias for the accepted studies. The researcher evaluated all papers one by one according to the grading system of the tool.

**Effect Measures and Synthesis Methods**

According to the accepted articles, there was 23.4% male participation and 7.9% female participation, while the unknown gender of participants was 68.7%. 29.5% of the participants were under 16 years old and 70.5% were considered as adults.

Note: many articles did not mention the gender or the age of the participants, but they only introduce the subjects as students, teachers and instructors. That is why the researcher was not able to include the age mean.

**Results**

**Study Selection**

The database scan yielded 226 non-duplicate citations (Figure 1). After reviewing the titles and abstracts, 31 papers were deemed possibly pertinent, and each of these articles was subsequently read in its entirety. The full-text articles’ reference lists were also checked for other pertinent sources. 5 articles were not relevant or did not mention deductive and inductive teaching. A total of 26 papers met the eligibility criteria and were included in the systematic review and are summarized in Table 1.

**Study Characteristics**

Two of the 26 studies (1,21) used a documentary method while the other 24 studies used the deductive and inductive methods directly on subjects. All 24 studies used teachers or coaches and students as samples.

**Reporting Biases**

In our study and according to Table 2, we found that 2.7% of the articles have some unclear risk of bias while 97.3% have a low risk of bias with 0% of high risk of bias in all articles.

**Table 2.** Risk of Bias in Studies:

Study	Criteria	Random sequence generation	Allocation concealment	Blinding of participants and personal	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Other bias
Rahman (2018)		≈	↓	↓	↓	↓	↓	↓
Mackintosh (2011)		↓	↓	↓	↓	↓	↓	↓
Levy (2009)		↓	↓	↓	↓	↓	↓	↓
Hilland (2018)		↓	↓	↓	↓	↓	≈	↓
Stoszkowski (2016)		↓	↓	↓	↓	↓	↓	↓
Gaona (2020)		↓	↓	↓	↓	↓	↓	↓
González-Calvo (2018)		↓	↓	↓	↓	↓	↓	↓
Hordvik (2019)		↓	↓	↓	↓	↓	↓	↓
Robertson (2020)		↓	↓	↓	↓	↓	↓	↓
Frederiksen (2012)		↓	↓	↓	↓	↓	≈	↓
García-Zambrano (2022)		↓	↓	↓	↓	↓	↓	↓
Loor-Macías (2022)		↓	↓	↓	↓	↓	↓	↓
Bravo (2021)		↓	↓	↓	↓	↓	↓	↓
Sanchez (2020)		↓	↓	↓	↓	↓	≈	↓
Pérez-Sánchez (2018)		↓	↓	↓	↓	↓	↓	↓
Atjonen, (2022)		↓	↓	↓	↓	↓	↓	↓
Sanchez (2019)		↓	↓	↓	↓	↓	↓	↓
Ritchie (2015)		↓	↓	↓	↓	↓	↓	↓
Shemwell (2015)		↓	↓	↓	↓	↓	↓	↓
Dinuta (2013)		↓	↓	↓	↓	↓	↓	↓
Li (2017)		≈	↓	↓	↓	↓	↓	↓
Kranzfelder (2019)		↓	↓	↓	↓	↓	↓	↓
Derakhshi (2016)		↓	↓	↓	↓	↓	↓	↓
Jayalaxmi (2015)		↓	↓	↓	↓	↓	↓	↓
Oliveira (2016)		↓	↓	↓	↓	↓	↓	↓
Wahl-Alexander (2019)		↓	↓	↓	↓	↓	↓	↓

Grading System: low risk of bias ↓; high risk of bias ↑; unclear risk of bias ≈.

### Certainty of Evidence

The certainty of the evidence is high due to the low risk of bias and the imprecision of applying the methods of all subjects.

### Discussion

The aim of this review was to summarize the available knowledge of the deductive and inductive teaching approaches for better performance in physical exercises. Many articles were excluded from this review because of the use of deductive and inductive methods for analyzing only, without using these approaches to teach a new skill. They were instead using deductive and inductive methods for other life skills (i.e. language) which made it more difficult to find the correct articles (Hordvik, MacPhail, & Ronglan, 2019; Kranzfelder, Bankers-Fulbright, García-Ojeda, Melloy, Mohammed, & Warfa, 2019; Sanchez, Torregrossa, Woodman, Jones, & Llewellyn, 2019). The results reveal that the accepted papers mostly aimed at the progression of learners in terms of learning a new skill. While other papers focused on the relationship between the teacher (coach) and the learner at the time of using the two approaches. The majority opinion is that the Inquiry method of teaching is the simplest method of the inductive approach, and it might be the best one for inexperienced or previously traditional instructors to begin with (Mohamad, Alali, Abd Malek, & Nadzalan, 2021).

This study has potential limitations. The main limitation was the lack of studies using the deductive and inductive approaches in physical exercise teaching, another limitation was the use of the term (deductive and inductive) as many studies were using these approaches but without mentioning them directly. Some papers did not mention the exact number or the gender of the subjects participating in the research which made this review more difficult to be done (Li, Cox, & Ford, 2017; Wahl-Alexander, & Curtner-Smith, 2019).

The small number of articles related to deductive and inductive approaches in sport exercise teaching included in this review reflects the limited research that has been done. There are many similarities between these approaches and others that may lead to false anticipations. Because of the small number of publications that met the inclusion criteria, it is noted that the themes described previously in the research may not be widely generalizable (Oliveira, & Brown, 2016).

While this systematic study is the first to give a full summary of deductive and inductive teaching in physical exercises (as we know), there are several limitations in this paper. First, the findings reflected in this paper do not necessarily reflect valid results as the reliability of coaches (instructors) was not discussed. It has been argued that the deductive method has a lower or limited improvement compared to the inductive method. Yet, many factors should be considered and focused (age, gender etc..) to reach accurate results. Additionally, the term deductive and inductive should be used more often in studies related to physical exercise teaching (Pérez-Sánchez, Galstyan-Sargsyan, Pérez-Sánchez, & López-Jiménez, 2018).

### Conclusion

A total of 1430 subjects were included in all the accepted studies which consider a low number of subjects compared

to the results and the importance of the title. The majority opinion is that the Inquiry method of teaching is the simplest method of the inductive approach, and it might be the best one for inexperienced or previously traditional instructors to begin with. Researchers can utilize the descriptive data presented in this work to build hypotheses for further testing to better understand the deductive and inductive approaches in physical exercises. Furthermore, more researches are required to determine the use of deductive and inductive approaches in physical exercises teaching.

### Acknowledgment

The study is supported by IPS UPSI scholarship scheme for international postgraduate students.

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## Індуктивні та дедуктивні міркування у спорті та навчанні фізичних вправ: систематичний огляд

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 12 с., 2 табл., 2 рис., 18 джерел.

**Довідкова інформація.** Набуття навичок у навчанні нових фізичних вправ дуже схоже за процесом на вивчення інших навичок загалом. У навчанні техніки фізичних вправ можна використовувати два підходи до викладання та навчання. Найчастіше інструктори використовували дедуктивний метод в навчанні техніки вправ. Але в реальному житті досить часто можна почути, як спортсмени навчаються техніки вправ самостійно, з обмеженим керівництвом або впливом належних кроків або прийомів (індуктивно).

**Мета дослідження.** Це дослідження мало на меті визначити фактичну кількість проведених досліджень та/або порівняти використання дедуктивних та індуктивних підходів до навчання у викладанні вправ або спортивних навичок.

Матеріали і методи. У цьому систематичному огляді використовувалися рекомендації PRISMA для пошуку відповідної літератури. Прийнятні роботи оцінювалися на добросовісність, а відповідні висновки були об'єднані для проведення тематичного аналізу.

**Результати.** Двадцять шість досліджень фактично відповідали стандартам вимог і були відібрані для перегляду та аналізу. Загалом у цих відібраних дослідженнях взяли участь 1430 учасників. За винятком чотирьох досліджень, було виявлено, що інші дослідження мають низький ризик упередженості, що вказує на те, що дослідження є більш точними. Даний огляд показав, що більшість інструкторів (викладачів, тренерів) вважають за краще використовувати індуктивний метод. П'ять досліджень використовували індуктивний метод, а три дослідження використовували безпосередньо дедуктивний метод. Інші 18 досліджень використовували дедуктивні та індуктивні методи опосередковано або в поєднанні з іншими підходами. Метод індуктивного підходу був більш ефективним за результатами.

**Висновок.** Встановлено, що індуктивний метод навчання навичкам вправ є більш кращим головним чином через хорошу реакцію, отриману від студентів у більшості досліджень, і вважається більш ефективним для навчання нових вправ або спортивних навичок. Дедуктивний метод не був повністю відсунутий на другий план, але він менш бажаний.

**Ключові слова:** дедуктивне та індуктивне навчання.

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**Cite this article as:** Alhussin Alali, A., Alhossin Alali, A.A., Baki, M.H.B., Madarsa, N.I., & Mohamad, N.I. (2023). Inductive and Deductive Reasoning in Sports and Exercise Coaching Process: A Systematic Review. *Journal of Learning Theory and Methodology*, 4(2), 57-68. <https://doi.org/10.17309/jltm.2023.2.03>

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Received: 03.07.2023. Accepted: 30.07.2023. Published: 31.07.2023

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