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# A review of concept-based teaching and learning research literature

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**Abstract**
Education is a critical component of human capital, with early investment yielding substantial returns. Numerous factors influence children's educational achievement, yet the specific variables impacting school performance remain underexplored, particularly in developing contexts. This review synthesizes existing literature on the determinants of school achievement, emphasizing the roles of school facilities, teachers' competencies, student mindset, and innovative teaching techniques. It highlights the importance of targeted interventions to enhance these factors, advocating for future research to establish robust evidence on their societal impacts. Concept-based teaching and learning (CBTL) are explored as a potential approach to foster deeper understanding and skill transfer in students, enhancing educational outcomes.

**Keywords:** School performance, education, learning, students, teachers, teaching techniques, concept-based learning

## Introduction
Concept-focused Inquiry combines two distinct pedagogical approaches: Concept-based learning and inquiry-based learning. One of the main elements of inquiry-based learning is the use of active questions to direct learning. Students are encouraged to actively participate in posing and answering questions in order to build meaning. Students are finally able to apply what they have learnt outside of the course by identifying patterns and making connections thanks to concept-based learning. This is ultimately what we all desire for our students. Concept-based inquiry is a teaching and learning approach that can be used with any subject or multidisciplinary curriculum. By activating students as thinkers, we increase conceptual understanding, foster learning transfer, and develop student agency.

## Why use concepts in teaching and learning?
Concept-based teaching and learning (CBTL) has a remarkable educational background. Hilda Taba's thoughts had an impact on how people thought about the subject matter and how to teach it in the early 1960s [Birbili, 2015] [1]. In order to effectively instruct pupils, teachers need to understand a variety of knowledge levels, from facts to underlying concepts and principles, as stated by Taba [1962] [2]. If too much factual information was presented too quickly, students would find it difficult to make connections between what they had learned so far and what they still needed to learn. She claimed that if newly taught material had nothing to do with what the kids had just learned, they would quickly forget what they had just learned. Concept-based education fosters students' ability to think critically, reason abstractly, and create original lessons! Using a teaching strategy that fosters conceptual thinking and problem-solving abilities, you can go beyond simply imparting knowledge.
An engaging curriculum that emphasizes the use of one's intellect while recapitulating kids' natural curiosity about the world is known as Concept-Based Learning. Teachers that use concept-based learning will acquire the following skills:

- Fulfill the requirements of the demanding academic curriculum
- Create disciplinary units using the Structure of Knowledge and Process.
- Utilizing inductive teaching, encourage student inquiry.
- Make quality generalizations by identifying conceptual lenses.

## Theoretical Framework
Based on previous research, a theoretical framework is constructed based on an established theory.

Research and investigation serve as the foundation for the development of a conceptual framework. It comes from a research question, or questions, that need to be looked into. Both a theoretical and conceptual framework are possible. Concepts are welcomed and used to drive content and process skills through inquiry in concept-based approaches. The growth of deeper thinking is made possible by this learning, which is blended and authentically tied to the real world. Constructivist methods are used to create knowledge and meaning via experiences and engaged, real-world learning chances. When combined with concepts, this leads to specifically concept-based deeper thinking and understanding. An inquiry-based approach fosters creativity, critical thinking, and learning reflection in young people.

Because concepts are wide, they enable the creation of links within, between, and across subjects, facilitating the development of transferrable skills. In contrast to contemporary educational models, which are concept-based, more conventional educational paradigms are content and skills-based. These acknowledge the importance of the concepts that underpin the knowledge and abilities and are connected to themes, major concepts, and inquiry-based learning methodologies. By using transferable higher-order thinking skills, the student is thereby introduced to deeper thinking. This can only be found in a three-dimensional curriculum that values concepts as an essential part of learning together with knowledge and abilities. Unlike traditional education, which is more strongly focused on memorization and rote learning and can lean more toward a teacher-centered approach, this approach allows for a focus that is more student-centered and inquiry-driven through concepts.

**From information to ideas**

Every knowledge base has a different level of complexity [Oosterhof, 2011] [3]. While factual information holds significant value in education, it may not always facilitate students' application of acquired knowledge in specific scenarios. It appears that in addition to processing facts, the human mind also processes concepts, or larger ideas. If these two types of knowledge are to be useful in a variety of circumstances, they must be tied to one another. People, places, and times are all pertinent to episodic memory. Conversely, individuals with similar cultural backgrounds are more likely to have conceptual knowledge in common.

concepts and how students often develop them. In the context of human knowledge, knowledge representation has been defined as "a systematic way of codifying human knowledge" [Binwal and Lalhmachhuana, 2001] [4]. A key element of this type of representation is the elaboration of (a) a collection of worldly concepts and (b) the relationships between them [Gärdenfors, 2000] [5]. Understanding the nature of concepts, their organization, and their capacity for growth and development seems to be crucial to understanding how people perceive the world. As educators, we must also understand how to ensure that education is the means by which younger people obtain this information [Smith and Zeng, 2006] [6].

We recognize and communicate millions of ideas every day, the majority of which we acquire without realizing it. Since concepts are the basis for meaning formation and communication, it is almost impossible to imagine trying to communicate without them. Unless my listener had seen this same animal and could match it to my description, the process would be quite "hit-and-miss". Even then, I would have to go through every detail of this cheerful, hairy, four-legged creature. That's a notion in and of itself, so I couldn't just call it a cocker spaniel.

Piaget's [1957] [7] theory of cognitive development is probably the most well-known of all these theories. It was the product of years spent observing children-his own included-in their natural environments as opposed to laboratories. It has greatly influenced and is mostly to blame for the development of the constructivist learning model. However, it would be viewed as relatively unsophisticated now that a great lot of research into the conceptual creation process has overtaken it. Four key components have been identified by research on concept development in young children [Gelman, 1999] [8].

1. Concepts are tools that help organize experiences in an efficient manner. As a result, they significantly affect children's reasoning in both positive and negative ways. But concepts do more than just help organize information in memory efficiently.
2. Preschoolers are also capable of reasoning about abstract concepts. It's customary to say that children and adults fall into separate categories, such as concrete and abstract or conceptual and perceptual. However, these divisions fall short of adequately capturing the range of abilities possessed by children. When given appropriately difficult tasks, children can surpass what the development models indicate they are capable of and show abilities they would not utilize in their daily life [Donaldson, 1986] [9].
3. Different tasks, people, and topic areas require different conceptual understandings from children. Specialization can have unanticipatedly powerful effects. Although experts don't seem to be generally smarter or more skilled than novices, they may know more about the particulars of their profession. [Chi, 1978] [10].
4. Children’s concepts reflect their emerging “theories” about the world. To the extent that children’s theories are inaccurate, their conceptions are also faulty, yet they may still inform their more general thinking. [Gelman and Williams, 1997] [11].

**Which teaching strategies and tactics appear to encourage the development of conceptual understanding?**

According to Erickson [Erickson, 2008] [12], concept-based education must involve more than just imparting knowledge to students. Rather, it concentrates on communicating the essential concepts of a subject while bolstering them with relevant data, facts, or information [Sim, 2016] [13]. Generalizations and broad conceptions like this act as "hooks" or "hooks" onto which new information can be "hung." If the information does not seem to suit the existing conceptual hook, they can tweak it or develop a new one. Inquiry-based instruction is incorporated into lesson plans by teachers as part of the CBTL process, which has been called a learning cycle [Mucenski, 2004] [14].

Lesson styles are important, but maybe even more important are the relationships that take place in a classroom between teachers and students. In traditional education, when teachers are in charge of most contacts, impart knowledge mostly through lectures and questioning, and most of their questions have predefined formats, this kind of engagement

is rather simple. The IRF pattern [Sinclair and Coulthard, 1975] [15], or the pattern of instructor questioning, is arguably one of the most prevalent features of classrooms. The first result of this common discourse pattern is that teachers talk a lot more than students do in almost every lesson, and the teacher-planned sequences take precedence over the way that students think.

This is not to argue that teachers shouldn't ask questions in the middle of the lesson. Nevertheless, it has been suggested [Chang-Wathall, 2016] [16] that leading questions, which are designed to deviate slightly from typical teacher inquiries (to which most teachers already know the answer!), can help students make generalizations. There are three different kinds of guiding questions: Conceptual questions connect the factual content to the ideas that support it (i.e., "how" or "why" questions); factual questions focus on material that has been determined that students must understand (i.e., "what" questions) and open questions, also referred to as debatable or provocative questions, encourage reflection and discussion.

According to a suggestion [Tan, 2017] [17], educators should think about using questioning as a powerful tool to ask thought-provoking questions that force pupils to think critically. One powerful exercise that has been used in classrooms for a long time is asking questions. This is a systematic way of looking for and eliminating theories that lead to inconsistencies [Tomlinson, *et al.*, 2002] [18]. It's thought that leading fruitful classroom conversations is more of an art than a science, and teachers don't always know exactly what strategies to employ to achieve this.

This classification bears striking resemblance to Alexander's [2017] [19] dialogic teaching paradigm, which has been extensively researched in elementary education. The most recent study found that, on average, students who got a dialogic teaching intervention had improved [56].

## Outcomes

To conduct a thorough evaluation of the research material for this study, 158 papers in total were assessed. three major issues served as the framework for this literature evaluation. the goal of concept-based teaching and learning, according to the literature review, is to support the formation of concepts that support the generation and comprehension of ideas, the transfer of knowledge and skills, and a critical or reflective viewpoint on knowledge itself. though many models have been proposed, not all of them have been investigated and explored in detail. the literature links specific pedagogical elements, such as inquiry-led learning, practical learning activities, and dialogic discourse.

## Conclusion

Enhancing school achievement requires a multifaceted approach that addresses both intrinsic and extrinsic factors affecting students. Key elements such as school facilities, teacher competencies, student mindset, and innovative teaching techniques play pivotal roles. Embracing concept-based teaching and learning (CBTL) can significantly contribute to deeper understanding and skill transfer, fostering critical thinking and problem-solving abilities in students. Future research should focus on robust, evidence-based interventions targeting these variables to maximize educational outcomes. By prioritizing these factors, educational systems can better equip students for academic success and lifelong learning.

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