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POSSIBILITIES FOR IMPROVING TEACHING PRACTICE THROUGH THE APPLICATION OF INQUIRY-BASED LEARNING

Abstract: *Contemporary society, in which the education system is an integral part, is facing increasingly dynamic educational challenges in the 21st century. The implementation of an inquiry-based approach to teaching is emerging as one of the responses to such challenges. By moving away from the traditional way of teaching, it is possible to enhance the quality of learning and teaching, encourage an active role of the students, and thereby contribute to the comprehensive development of their competences that prepare them for life. In the educational context, it is necessary to provide students with a suitable experience for the development of competences and skills needed for effective inquiry-based learning. Inquiry-based learning methods can greatly contribute to the development of problem-solving skills and critical thinking in students who are transferred from school to everyday activities. In creating a stimulating and dynamic learning environment and engaging students in inquiry processes, the role of the teacher is crucial. They lead, guide, and support students in independent problem-solving tasks and in drawing conclusions, enabling them to gain insights into the world around them.*

Keywords*: critical thinking skills, inquiry-based approach, teachers' role, traditional teaching*

INTRODUCTION

Today's students cannot be taught in the same way as those before they were taught a few years and decades ago. One of the key components is that students need to be active participants in the learning process, self-regulate it, and take responsibility for it. Inquiry-based learning, as found in Gholam (2019), is a teaching approach in which students engage in meaningful tasks such as independent tasks, projects, and research for contextual learning, with collaboration expected from students in solving a problem task as well as in acquiring research skills. This concept involves investigation, thinking, and questioning, as well as experimenting with different possibilities that students will explore. They connect prior and current knowledge with real experiences, learn to make assumptions and act purposefully to understand the process. They learn to collect data and explain what they have discovered through inquiry. They use scientific methods to develop and test theories for solving problems in various ways, advocating for their own viewpoints and providing justification for them (Rubio & Conesa, 2022). Serafín et al. (2015) define inquiry-based learning as an approach that involves various motivational methods, organizational forms, and problem-based learning where the teacher does not transmit instructional content via presentation but encourages knowledge creation through problem-solving and questioning.

Inquiry-based learning aims to engage students in the process of authentic scientific discovery. From a pedagogical perspective, the complex scientific process is divided into smaller, logically connected units that guide students and draw attention to important features of scientific thinking (Pedaste et al., 2015). Inquiry provides opportunities for students and teachers to initiate and conduct their own investigations, and the acquired new knowledge supports them in analysis and discussion, encouraging most students to engage more deeply in learning and better understand the process itself. The freedom to choose research (within set options) and the way of managing the process is considered very useful (Major, 2012). In inquiry-based learning, teachers pose open-ended questions to stimulate active discussion and student participation, whereas students typically offer diverse responses within the context of open learning. In such an environment of active learning, students can freely pose creative questions and combine previously acquired knowledge and current experience to explore data and relationships to develop new knowledge and deepen understanding of existing knowledge. Experienced teachers are more successful in implementing inquiry methods in teaching, whereas novice teachers often face the challenge of effectively responding to and explaining answers to students in a simple and meaningful way, thereby offering them a ready solution (Chowdhury, 2016).

Inquiry-based learning presents a unique challenge to students through which they can learn various types of information, monitor their learning, and explore problems by seeking solutions. However, when students encounter challenges during the implementation process, foundational knowledge, concepts, and skills

help them overcome and complete tasks. Although much information is available through the internet, teachers need to adopt a range of strategies to encourage students' problem-solving abilities and to assist them in constructing and applying their own knowledge (Fan & Ye, 2022). In addition to their cognitive skills, they can develop students' psychomotor and affective abilities. Inquiry-based learning is based on the assumption that students have an innate need to seek and find their own knowledge. The main goal of inquiry-based learning is to help students develop intellectual and cognitive skills by being guided by curiosity in asking questions and receiving answers (Andrini, 2016).

In the approach to inquiry-based learning, teachers are expected to continuously monitor and evaluate students and, if necessary, guide them through specific activities to help them develop their own learning at each stage of the teaching and learning process. Students are expected to take on important roles and to plan, implement, and evaluate their own learning processes. Furthermore, they are expected to act as researchers, collaborate within a group, develop theories, and collect data to test theories, present results, and share conclusions with others (Boğar, 2019).

Pedaste et al. (2015) propose five different general phases of inquiry through a systematic review of the literature related to inquiry-based learning: orientation, conceptualization, inquiry implementation, conclusion, and discussion. Liu et al. (2020) described four types of inquiry-based learning: initial (students are provided with questions, procedures, and solutions in advance), structured (students are given questions and procedures, and they arrive at solutions based on collected evidence), guided (students are given questions, and they devise procedures and generate solutions), and open (students develop their own questions, devise and conduct research, and present results). The authors emphasize that in guided and open inquiry, students develop deeper scientific thinking and reasoning.

METHODOLOGY

This paper provides an overview of the literature on the application of the inquiry-based approach in teaching and educational contexts. The aim was to examine the significance and applicability of the still underrepresented pedagogical approach, inquiry-based learning, in contemporary educational settings. In addition, we analysed its possibilities, advantages, and challenges in the environment of nontraditional learning. In this paper, an overview of the features of inquiry-based learning, as well as the changes and benefits it brings for both students and teachers, is provided. We analysed studies related to the inquiry approach in teaching conducted in the last decade, with a particular focus on the following three questions:

1. What are the main characteristics of inquiry-based learning?
2. How does inquiry-based learning impact students?
3. What are the advantages of inquiry-based learning?

We searched the following scientific databases: EBSCOhost, ERIC, Google Scholar, J-Store, SAGE, and ScienceDirect. In the first phase, initial keywords were identified on the basis of researchers' knowledge in that area. This includes: teacher, inquiry-based learning, the benefits of the inquiry-based approach in teaching and critical thinking skills. The free application Zotero (https://www.zotero.org/) was used for storing selected literature. For the selection of studies to be used in this review, the free web application Rayyan (Ouzzani et al., 2016) was utilized. In the next phase, both authors independently selected a relevant list of literature. Their acceptability was assessed via the following criteria for studies included in their samples: a) publication year from 2013 to 2023; b) research methodologies: quantitative, qualitative, mixed methods, systematic literature review, and review articles; c) studies conducted in schools; d) studies in the English language. Thirty-one articles were selected for in-depth analysis. The literature on the inquiry-based teaching approach was organized into two dimensions relevant to the research aim: characteristics of inquiry-based learning and inquiry-based teaching (Table 1).

Table 1.

Dimensions of educational practice

Dimensions of educational practice	References
Features of inquiry-based learning	Aghazadeh (2020) Andrini (2016) Attard, Berger & Mackenzie (2021) Duran & Dökme (2016) Gholam (2019) Hofer & Lembens (2019) Kang & Keinonen (2016) Khalaf & Zin (2018) Loizou & Lee (2020) Prayogi & Wasis (2018) Şen, Ay & Güler (2021) Serafín et al. (2015) Shamsudin, Abdullah & Yaamat (2013) Smallhorn, Young, Hunter & da Silva (2015) Susilowati, Sajidan & Ramli (2018) Wheatley (2018) Vieira, Flores, da Silva, Almeida & Vilaça (2021)

Table 1. *(continued)*

Dimensions of educational practice	References
Inquiry-based teaching	Abdi (2014) Bailey (2018) Bayram, Oskay, Erdem, Özgür & Şen (2013) Boğar (2019) Fan & Ye (2022) Friesen & Scott (2013) Kuklok (2016) LePage-Kljajic (2019) Rubio & Conesa (2022) Sotiriou, Lazoudis & Bogner (2020) Suduc, Bizoi & Gorghiu (2015) Thaiposri & Wannapiroon (2015) Wang, Wu, Yu & Lin (2015) Wilson (2020)

RESULTS AND DISCUSSION

In this section, we critically discuss the literature on inquiry-based learning on the basis of the identified dimensions, that is, the features of inquiry-based learning and inquiry teaching. The review provides a summary of the content of inquiry-based learning, which includes a relevant description of the inquiry approach in teaching as well as its overall perspective, argument, or purpose.

FEATURES OF INQUIRY-BASED LEARNING

Inquiry-based learning is primarily a way of thinking. Therefore, a profound change in values grounded in education is needed. Representing much more than a teaching technique, it cultivates individuals capable of critical thinking, problem-solving, and making well-reasoned decisions in social and personal life (Aghazadeh, 2020). Inquiry-based learning has not only been shown to be effective in improving students' critical thinking skills (Prayogi & Wasis, 2018; Susilowati et al.,2018), but also to contribute to the development of students' autonomy, encouraging them to take responsibility for their own learning. Fostering the development of autonomy in students involves providing opportunities for formulating and investigating questions based on evidence. On the basis of the principles of the scientific method, students observe a phenomenon, synthesize research questions, test those questions in a replicable manner, and finally analyse and communicate their findings (Smallhorn et al., 2015). Similarly, Duran and Dökme (2016) conclude that this approach has a more positive effect on students' level of critical thinking and that traditional

teaching, which is reduced to textbook learning, does not result in significant improvement in students' critical thinking. Active student participation in class through engaging in instructional activities and responding to questions within and between group discussions positively contributes to the development of their critical thinking. Furthermore, the research findings conducted by Şen et al. (2021) demonstrate that the implementation of inquiry-based learning leads to students making progress in reasoning skills and explanations, as well as in the development and generalization of operational strategies. Students arrive at solutions to real-life problems via various strategies in the process of inquiry-based learning through deductive and inductive reasoning based on their existing knowledge and experiences.

Khalaf and Zin (2018) identified key deficiencies of traditional learning models and inquiry learning models that impact their effectiveness through a systematic literature review. While the traditional learning model has encountered deficiencies in student knowledge, skills, competences, and outcomes, the inquiry learning model faces serious shortcomings in terms of its application and function. The drawbacks of inquiry-based learning during its implementation are associated with the functioning of the educational system, the curriculum, the role of the teacher, the students' ability to apply technology in learning, and the ability to regulate learning activities. Vieira et al. (2021) examining the advantages and disadvantages of the inquiry-based learning model determine how it promotes the development of research competences, multiple knowledges, and personal visions of education based on humanistic and democratic values, which can enhance teachers' professional practice. In a study conducted by Loizou and Lee (2020), teachers, students, and parents expressed positive opinions and agreed that interaction during teaching through inquiry-based learning is crucial for understanding the purpose of educational activities. Compared with traditional teaching, students and teachers believed that the activities were more interesting, motivating, and engaging, especially when technology was used.

Teachers encounter a lack of autonomy and time in preparing and implementing inquiry-based learning activities, as well as insufficient and inadequate professional development related to this topic (Kang & Keinonen, 2016). Hofer and Lembens (2019) reported that a carefully designed professional development program changes teachers' beliefs and attitudes about inquiry-based learning and its application in teaching. Research results show that support for teachers in planning, implementing, and reflecting on inquiry-based learning enables familiarity with the processes of inquiry and the implementation of inquiry-based learning as an effective approach to teaching. Attard, Berger, and Mackenzie (2021) conducted a study on the observed impacts of inquiry-based learning on student engagement, facilitated by teachers' professional learning within the context of two main infrastructure programs.

The research results show the impact of a professional learning program on teachers' understanding of designing and implementing inquiry-based learning within STEM disciplines. This has resulted in significant shifts in relation to existing practices, which subsequently led to observed changes in student engagement within the operational, cognitive, and affective developmental areas. It seems that perceived increases in engagement influence their ability to apply previously learned knowledge within a relevant and interesting context.

Students learn better when they can choose between activities and when they can adapt those activities to their own learning styles. Specifically, inquiry-based learning allows teachers to adjust the level of student autonomy, enabling them to guide students in the learning process (Wheatley, 2018). The teacher's role is purely facilitative, assisting students in learning and utilizing skills in their own process to acquire a higher level of knowledge. It is necessary for the teacher to have a comprehensive picture of how the teaching and learning process unfolds and what steps are needed to successfully execute tasks and achieve expected outcomes. Teaching and learning strategies outline the actions needed to achieve set objectives (Andrini, 2016). Serafín et al. (2015) mainly focused on the teachers' thinking about teaching practices. Evidently, they emphasize inertia and the adoption of previously acquired passive teaching styles in education which are difficult to change into progressive teaching approaches. This leads to an increased need for the development of specific competences in the areas of specific didactic disciplines.

The application of inquiry-based learning by an enthusiastic and motivated teacher who is willing to continuously question and reshape thinking patterns enables students to engage in a classroom culture that enhances collaboration, problem-solving, reflection, differentiation, motivation, and above all, the application of knowledge and skills in facing new challenges (Gholam, 2019). Kang and Keinonen (2016) highlight collaboration among teachers and their confidence in their own teaching as common and strong predictors for the implementation of inquiry-based learning due to its positive impact on students' achievement and motivation. The use of communication, collaborative and thinking skills is key in the teaching process (Şen et al., 2021). Shamsudin et al. (2013) claimed that all teachers were satisfied with the choice of this teaching approach. Not only did they feel somewhat successful in terms of the educational content they intended to teach, but they were also satisfied with the students' reactions, especially with the intention to ask questions and the working atmosphere in which the discussion and exchange of information took place.

INQUIRY-BASED TEACHING

Bognar and Matijević (2005) define inquiry-based teaching as the type of teaching in which students independently gain new insights through research.

Certainly, the internet has accelerated and facilitated the flow of information, making it more accessible to students. Access to databases and digitized sources such as historical archives, virtual museums, and virtual atlases support the research process as students can develop disciplinary research skills through observation, interpretation, and analysis of data from these sources (Aghazadeh, 2020). Research findings (Thaiposri & Wannapiroon, 2015) demonstrate that information and communication technologies play a significant role in fostering student learning in the 21st century. In addition, they indicate that improving critical thinking skills through inquiry-based learning activities using social networks helps students develop the knowledge and skills they will need to succeed in the technologically advanced era. Utilizing digital platforms in inquiry-based learning enables effective assessment of students' learning progress, monitoring their reactions, fostering student interest, and gaining insight into problem-solving processes. In deep learning, which involves long-term, sustainable, and successfully acquired cognitive knowledge, all the steps that students take to solve a problem are important (understanding and characterizing the problem, presenting the problem, solving the problem, and reflecting on and communicating the solution) (Sotiriou et al., 2020).

The majority of students are more passive, timid, or shy in expressing their opinions, which can disrupt uninterrupted learning and creativity in student learning (Andrini, 2016). They most often acquire information without questioning and internalizing, and due to the passive position they hold, they cannot learn how to learn (Boğar, 2019). Inquiry-based learning involves a departure from traditional teaching, which is characterized mainly by direct and one-sided instruction, or factual knowledge that students must become acquainted with and blindly accept. In addition, this approach fosters students' interest, requires them to solve problems through logical reasoning and evidence-based arguments, encourages them to further study in order to develop more detailed explanations, and emphasizes the importance of explanations based on evidence (Abdi, 2014).

Several studies below discuss the positive impact of inquiry-based learning on student achievement. Research results conducted by Abdi (2014) indicate that there is a significant difference in the levels of achievement between students taught using inquiry-based learning and students educated via traditional teaching methods. In other words, students who utilized inquiry-based learning became more successful than students who applied traditional teaching methods. Diverse and extensive research in a systematic literature review (Friesen & Scott, 2013) indicates that various approaches to inquiry-based learning positively impact students' ability to comprehend fundamental concepts and procedures and create a more engaging learning environment. It is necessary to promote a range of strategies to maximize the effectiveness of inquiry-based learning, such as developmental activities, formative feedback,

and inquiry methods crucial to the learning process. The research conducted by LePage-Kljajic (2019) also confirms that inquiry-based learning has a positive effect on student achievement, particularly due to the group dynamics and communication aspects involved in the research. Inquiry activities motivate students to construct, argue, and evaluate their own explanations and represent an effective way to confront misconceptions. In addition, they develop critical thinking skills that they will further transfer in many aspects of life after primary and secondary education.

The results of the study (Wang et al., 2015) show that the implementation of inquiry-based learning in teaching has a positive impact on students' motivation and interest in learning and confirm the importance of the school environment context with respect to the effectiveness of teaching implementation. In other words, different environments have different effects on the outcomes of implementing inquiry-based learning in teaching. Similar results are also reported by Wheatley (2018), who concludes that compared with traditional teaching, inquiry-based learning leads to better student engagement during lessons, improved critical thinking, enhanced achievements, better attitudes toward learning, and better understanding of knowledge, as well as their overall satisfaction. Furthermore, research conducted by Wilson (2020) shows that the implementation of inquiry-based learning has a positive and direct relationship with student achievements. Students can gain deeper understanding through practical and experiential learning, which has an overall positive impact on memory recall and knowledge retention. Suduc et al. (2015) also demonstrated that the application of inquiry-based learning in teaching various aspects is more relevant for students than conventional instruction is. In addition, they show that it is important for elementary school students not only to participate in instructional hours that are interesting, but also to understand the subject matter and participate in activities that are useful to them in everyday life.

Similar results are also reported by Bailey (2018), who determined that inquiry-based learning is successful in improving students' academic achievement. In this way, students are provided with more time for questions and discussions on the topic with peers and the teacher. They are more engaged in collaborative activities that enable them to think critically. Students are more eager to participate in activities and more successful in carrying out activities when they have others who support and guide them through the inquiry process. Based on the research results of Rubio and Conesa (2022), the best way of learning is through research. The high level of enjoyment and interest of the majority of students in this research, as well as their grades which were excellent or very good, come to the forefront. In this way, students are enabled to learn more intensively, allowing them to use and apply that knowledge to a specific topic in a different situation. In addition to fostering motivation and activity among students and improving their attitudes towards learning, well-structured

problem questions within the framework of inquiry-based learning contribute to the development of learning with understanding (Bayram et al., 2013). The results of the study (Fan & Ye, 2022) show that students positively evaluate this learning model because it helps them improve their self-confidence in research as well as problem-solving (Kuklok, 2016).

CONCLUSION

Traditional learning models are increasingly encountering certain shortcomings that subsequently affect students' knowledge acquisition and learning outcomes. This has certainly favor the implementation of new learning models that contribute to changes in learning styles and approaches by directing them toward the student, rather than the teacher. One of those models is certainly the model of inquiry-based learning. It is undeniable that the implementation of effective inquiry-based learning activities is quite a challenging task considering that students often lack greater cognitive skills. It is important to note that increasing the scope of educational content challenges and complicates the organization of the teaching process, which is centered around inquiry-based learning. However, various teaching methods and techniques are currently being applied in schools with the aim of obtaining a deeper understanding and application of concepts to improve the teaching process. Such an approach to teaching develops research skills and attitudes that are applicable to students in everyday situations.

A high level of student engagement in solving research tasks should be preceded by their readiness for it as well as thorough preparation by teachers, their understanding of the implementation of the inquiry-based learning method, and the availability of classroom/school teaching materials. Therefore, it is important that this teaching approach is designed and implemented in a way that encourages the development of students' research skills and attitudes that they will be able to apply in everyday life. The abilities of critical thinking, asking questions, analysing, making connections, and drawing conclusions are just some of the potentials that can be developed in students through the implementation of inquiry-based learning. Therefore, inquiry learning methods can stimulate the development of organized and self-regulated learning abilities so that students become increasingly independent in the learning process and learn how to overcome difficulties. Their contribution to quality teaching practices is reflected in the continuous examination of the relationships among students' knowledge development, learning models, and the teacher's role in instruction.

The results of the study emphasize the need for contemporary teaching strategies that promote meaningful connections, deepen understanding, critical thinking, problem-solving, and student engagement in the classroom.

Accordingly, teachers should focus on questions that strengthen innovative educational methods and approaches in teaching, enabling students to participate in activities that encourage self-regulated learning and the construction of their own knowledge. Consequently, it is necessary to design professional development programs for teachers that encourage them to implement and integrate this approach into their teaching practices. This approach clearly requires continuous investment and dedication from teachers by allocating significant time and effort to implement this design and providing ongoing feedback. However, if we want students to receive the best and highest quality education, these constraints must be overcome. This study points to the responsibility of educational policies towards ensuring professional development and support for teachers in the practical implementation of inquiry-based learning to increase their knowledge and skills in pedagogical content. Ensuring appropriate support for school administration and educational policies, as well as adapting activities to students' developmental opportunities, enhances teaching practices through the implementation of inquiry-based learning, which appears to be an achievable educational goal. Future research could examine students' perceptions of the impact of inquiry-based learning on their motivation and interest in learning.

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