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PROJECTS AS A LEARNING TOOL IN TECHNICAL TRAINING: A FOUNDATION BASED ON LITERATURE

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ABSTRACT

This article addresses the importance of project-based technical education as an effective modality to train professionals prepared for the job market. The research seeks to demonstrate, through a literature review, how this pedagogical approach contributes to the improvement of the quality of students' training and facilitates their insertion in the labor market. To answer the research question and achieve the proposed objectives, the methodology used was the bibliographic review and the synthesis of 9 studies on the subject. It is concluded, through the analyzed works, that project-based technical training represents for students a more meaningful and lasting learning, thus increasing their motivation and engagement in the daily life of classes and facilitating their entry into the job market.

Keywords: Technical Education. Project-Based Learning. Vocational training.

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INTRODUCTION

The labor market has been undergoing constant evolution, in this sense, we are in the era of the 4th industrial revolution that 'imposes' several challenges for the present day, such as the growing demand for instant information, complexity of production processes, influence on the consumption process, more and more demands regarding collaborative work, new tools and teaching platforms, among others. In this sense, the education system needs to follow this evolution and think of an education model that contemplates the real needs of the industry/market, transforming into a guide for students, what traditional teaching methods do not contemplate.

Furthermore, this article aims to understand how project-based technical education improves the quality of students' training? For this, the general objective is to demonstrate through the literature review how project-based technical education improves the quality of students' training and their arrival in the job market. The specific objectives are: to define professional technical education and to explain project-based technical education.

PROFESSIONAL TECHNICAL EDUCATION

Technical education is a teaching modality that aims to train qualified professionals for the job market, combining theoretical and practical knowledge. In this way, this modality of teaching differs from general education by having a more specific focus on technical skills and competencies related to certain professional areas (SITEAL, 2019).

Also according to SITEAL (2019), Technical and Vocational Education and Training (TVET) is a fundamental pillar for the equity, productivity and sustainability of countries. This educational modality contributes to improving the conditions of equal access to education, employment, entrepreneurship and decent work. The MEC (Ministry of Education) places professional technical education on the same level as technological education as defined below:

> Professional and technological education (EPT) is an educational modality provided for in the Law of Guidelines and Bases of National Education (LDB) with the main purpose of preparing "for the exercise of professions", contributing so that citizens can enter and act in the world of work and life in society. To this end, it covers qualification, technical and technological qualification, and postgraduate courses, organized in such a way as to provide the continuous and articulated use of studies. BRAZIL (2021).

Thus, qualifying people is developing skills and competencies for the job. This means that this type of education is a fundamental pillar for the equity, productivity, and

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sustainability of countries, as it aims to improve the conditions of equal access to education, employment, entrepreneurship, and decent work (SITEAL, 2019).

In Brazil, this type of education is governed by laws (11.892 of 2008 and 12.513 of 2011), composed of the Secretariat of Professional and Technological Education / Federal Network of Professional, Scientific and Technological Education / Sistema S (SENAI, SESI, SENAC, SESC, SEBRAE, SENAR, SEST, SENAT and SESCOOP) (SITEAL, 2019 and BRASIL, 2021).

PROJECT-BASED TECHNICAL EDUCATION

Facing the challenges of the modern world in the context of education requires a teaching model based on experiences, as stated by Piaget (1997) that it is essential that the individual in the school context interacts with real objects, that is, with challenges regarding the reality of the labor market. Thus, technical education, for example, based on real projects, tends to bring the student closer to what the market expects him to have at the end of his training.

Thus, education had to keep up with all the revolutions in order to train people and promote insertion into the labor market, in table 1 below it is possible to verify the evolution of education in the context of the four eras, adapted from (FÜHR and HAUBENTHAL, 2018; OLIVEIRA, 2019 and PUNCREOBUTR, 2016 *apud* NERI, 2020):

Table 1: Synthesis of the changes in the four eras of education

Educação	Contexto	Concepções	Educador	Estudante
1.0	Escolas paroquiais para formação cristã; sociedade agrária.	Consistia em aprender a ler, escrever, conhecer a bíblia, canto e aritimética. Posteriormente incluiu latim, gramática, retórica e dialética.	Figura central no processo de formação do estudante; considerado o detentor do conhecimento.	Recebia os ensinamentos do mestre de forma passiva.
2.0	Forte influência da Revolução Industrial, com tarefas repetitivas, mecânicas e trabalho individual; sociedade industrial.	Caracterizada pela padronização, concentração, centralização, sincronização e repetição.	Ensinava o uso operacional de tecnologia como ferramenta de trabalho.	Ensino informativo; estudante não era incentivado a ser criativo.
3.0	Novas concepções sobre os processos de ensino e aprendizagem; era da globalização.	Utilização de novas tecnologias com a aprendizagem e o uso de projetos para engajamento dos estudantes.	Precisa saber usar as novas tecnologias como potencial pedagógico.	Estudante autônomo, criativo, flexível; uso da tecnologia para auto aprendizagem; aprendizagem interativa (mídias sociais).
4.0	Facilidade de acesso à informação e comunicação sem limite tempo e espaço geográfico; era da inovação integrada ao conhecimento.	Projetos interdiciplinares, currículo flexível com foco no fazer.	Torna-se o orquestrador das múltiplas informações, com a função de auxiliar o educando a sintetizar e organizar as informações.	Busca soluções de forma autônoma; comunicadores eficazes; criadores singulares em suas áreas de especialização; autor do próprio conhecimento.

Source: adapted from Führ and Haubenthal (2018), Oliveira (2019) and Puncreobutr (2016) *apud* Neri (2020, p. 26).

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The table above portrays how much education has evolved since the 1.0 era, with students receiving teachings passively, to 4.0, with the search for solutions autonomously and being the author of their knowledge. Führ and Haubenthal (2018) collaborate by stating that educational institutions should propose a flexible curriculum based on know-how, which encourages students to seek solutions autonomously.

Thus, project-based education is an approximation of the student with the labor market and an incentive for the improvement of companies. For Acosta (2016), learning depends on a constructive process that occurs through constructions and reconstructions of an individual's systems of meaning and logic.

In their study "perceptions on the use of project-based learning in professional and technological education", Marques et al. (2023) address how the teaching and learning process has undergone constant updates to meet an increasingly technological audience. The authors highlight that project-based training is a promising approach to engage students and bring them closer to the world of work. However, they emphasize the importance of the challenges proposed in the projects being carefully designed to ensure the motivation and involvement of the students.

In this sense, project-based learning is a form of teaching that aims to carry out an activity that often comes from real situations, in order to generate greater motivation and learning in students in their training. When a student receives a challenge in which he needs to propose improvements to a company in his area of training, this brings him very close to what he will find on a daily basis in the work environment, hence the motivation to solve the challenge (MATTAR, 2017).

For Markham (2012), project-based learning should be seen as a philosophy of teaching and learning rather than an educational strategy, given its importance for students and for their entry into the world of work.

In this context, technical education is a model that allows the student a closer contact with the reality of the market, in this way, the Ministry of Education (MEC) reports that this model includes from technical professional qualifications of secondary level (EPTNM), as intermediate exits, to the corresponding professional qualification, also including:

> The courses and programs of technical professional education at the secondary level, which are organized by technological axes, enabling flexible, diversified and updated training itineraries, according to the interests of the subjects and possibilities of the educational institutions, observing the norms of the respective system and level of education for the EPTNM modality. BRAZIL (2021).

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In addition, students, institutions, companies and society can benefit when professionals are trained with excellence, such training for this study has at its core the insertion of projects as an object of learning in technical vocational training.

In this, the student will have to follow important steps, such as visiting customers (if it is a project external to the institution), preparing a schedule, describing the deliveries, documenting all phases of the project and finishing with the necessary success both for the satisfaction of customers and their approval by the board.

METHODOLOGY

The methodology used for the theoretical foundation was the bibliographic survey through theses, dissertations and articles in national and international journals indexed in the Scopus, Web of Science and Google Scholar databases and official sites such as UNESCO and MEC, using the Boolean operators AND and OR, combining the keywords "professional technical education", "professional training" and "labor market" and studies addressing the theme of technical education were included professional in the Brazilian context.

The time frame for the research was 15 years, except for the work of Piaget (1997), who, although his study was published more than two decades ago, his contributions to the understanding of cognitive development continue to be a reference in the area of education.

In addition, the type of research was descriptive and explanatory, with the objective of explaining and rationalizing the object of study, in order to expose the conceptions about the core of the work that has as its title "projects as a learning tool in technical training: foundation based on literature".

For this, the method of the approach used was qualitative, by characterizing interpretative attributions supported by the theoretical foundation, as well as the analysis focused on the identification of relevant themes in education, on the interpretation of the meanings attributed to the title of the research and on the construction of the synthesis of the analyzed works. The inclusion criteria for the studies were: articles published in indexed journals, empirical studies and case studies. The exclusion criteria were: opinion articles and studies directed only to other active methodologies.

Furthermore, the research has some limitations, such as the temporal delimitation and the concentration on studies carried out in the Brazilian context, which may restrict the generalization of the results.

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RESULTS AND DISCUSSIONS

The literature review revealed that project-based technical education promotes the development of several essential skills for the job market, such as problem solving, teamwork and effective communication.

Several studies have shown that students involved in projects have greater motivation, better academic performance and greater satisfaction with the learning process. Table 2 below shows a summary of the studies used in this article, corroborating the proposed objectives.

Table 2: Synthesis of the studies used in the theoretical framework

Referências	Principais contribuições	Foco da Pesquisa	Metodologia	Aplicação do Estudo
Marques et al. 2023.	Investigam as percepções de docentes e discentes sobre a implementação da aprendizagem baseada em projetos na educação profissional e tecnológica.	Implementação de projetos em instituições de ensino técnico.	Pesquisa qualitativa com entrevistas e questionários.	Ensino técnico
Brasil, Ministério da Educação, 2021.	Apresenta diretrizes e normativas para os cursos da Educação Profissional Técnica de Nível Médio.	Políticas públicas para a educação profissional.	Análise de documentos oficiais.	Ensino médio
Neri, H. G. F. 2020.	Investiga a aplicação da aprendizagem baseada em projetos na formação complementar de estudantes da educação básica.	Aprendizagem baseada em projetos na educação básica.	Pesquisa qualitativa.	Ensino fundamental e médio
SITEAL, 2019.	Apresenta um panorama da educação técnica e profissional na América Latina, destacando a importância da formação profissional para o mercado de trabalho.	Educação técnica e profissional na América Latina.	Estudo descritivo com base em dados estatísticos e documentos oficiais.	Macro
Führe e Haubenthal, 2018.	Discute os impactos da Educação 4.0 no século XXI, incluindo a importância da aprendizagem ativa.	Impactos da tecnologia na educação.	Revisão da literatura.	Geral
Mattar, J. 2017.	Aborda diversas metodologias ativas, com destaque para a aprendizagem baseada em projetos, enfatizando sua aplicabilidade em diferentes modalidades de ensino.	Metodologias ativas em diferentes contextos educacionais.	Revisão da literatura e análise de diferentes abordagens.	Variados
Acosta, O. C. 2016.	Analisa a recomendação de conteúdo em ambientes colaborativos de aprendizagem baseada em projetos.	Recomendação de conteúdo em ambientes colaborativos.	Pesquisa qualitativa e análise de dados.	Ensino superior
Markham, T. 2012.	Apresenta um guia para o design e coaching de projetos, com foco na aprendizagem ativa.	Design e implementação de projetos.	Prática profissional e análise de cases.	Variados
Piaget, J. 1997.	Aborda o papel da ação no desenvolvimento do pensamento, contribuindo para a compreensão dos processos de construção do conhecimento.	Desenvolvimento cognitivo e construção do conhecimento	Teoria do desenvolvimento cognitivo.	Geral

Source: author, 2014.

However, the implementation of this modality still faces challenges such as lack of resources, the need for teacher training and the difficulty in finding relevant projects. Since, to develop projects in companies with students in training, it requires the availability of employees of the participating company for the proper monitoring of the execution of the students' activities in the organizational environment.

CONCLUSION

The literature review carried out in this study evidenced the relevance of project-based technical education as an effective modality to promote the training of professionals prepared for the challenges of the labor market. By involving students in real projects, this modality stimulates the development of essential skills such as problem solving, teamwork,

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communication and critical thinking. In this way, it not only benefits students, but also contributes to the development of a more qualified workforce, capable of meeting market demands and boosting the country's economic development.

The results of the research also demonstrated that the implementation of project-based learning in technical education contributes to more meaningful and lasting learning, in addition to increasing student motivation and engagement. However, implementation still faces challenges, such as the need for continuing teacher training, the availability of resources, and the adaptation of curriculum structures. Thus, the research question was answered and the objectives achieved as the framework was constructed.

It is essential that educational institutions invest in actions that promote the implementation of project-based education, such as offering continuing education courses for teachers, creating collaboration networks between institutions and companies, and developing interdisciplinary projects that articulate theoretical and practical knowledge in the day-to-day life of educational institutions.

For complementary studies, it suggests investigating the impact of project-based learning on the employability of technical education graduates, as well as studying the perception of companies/industries about the training of professionals through project-based education.

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