Enhancing 21 St-Cetury Skills Through Project-Based Learning: Isights from Vocational Education in Egypt

Farhan Hanif*
Al Azhar University, Egypt
E-mail : farhanhanif0212@gmail.com

Abdurrahman
Al-Ahgaf University, Yemen
E-mail : abdulrahman060399@gmail.com

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**Corresponding Author*

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Abstract

This research examines the use of Project-Based Learning (PBL) as a strategy to develop practical skills among secondary school students in Egypt. Recognized as a modern and innovative teaching method, PBL actively involves students in the learning process, enabling them to apply theoretical concepts to real-world situations. Using a qualitative research approach, this study focuses on case studies of Egyptian secondary schools that have implemented PBL in their curricula. Data collection methods included interviews with teachers and students, classroom observations, and analysis of student projects, lesson plans, and curriculum documents. The findings indicate that PBL significantly improves the learning experience by motivating students and fostering active engagement. Students involved in group projects demonstrated better comprehension of academic material, stronger critical thinking, increased confidence in presentations, and improved collaboration skills. However, challenges such as insufficient resources, limited teacher training, and an exam-oriented curriculum pose barriers to PBL's success. Teachers often struggle with time management for project-based activities, and the effectiveness of PBL heavily relies on their ability to guide and facilitate learning. To overcome these issues, the study recommends enhancing teacher training programs, adopting more flexible education policies, and utilizing technology to diversify and enrich project-based activities. By optimizing resources and increasing awareness of PBL's advantages, Egypt's education system can better equip students with essential 21st-century skills.

Keywords: Learning Strategies, Practical Skills, Secondary Education

Abstrak

Penelitian ini mengkaji penggunaan strategi Project-Based Learning (PBL) untuk meningkatkan keterampilan praktis siswa sekolah menengah di Mesir. Diakui sebagai metode pengajaran yang inovatif, PBL secara aktif melibatkan siswa dalam proses pembelajaran dan memungkinkan mereka menerapkan konsep teoretis ke dalam situasi nyata. Pendekatan kualitatif digunakan dalam penelitian ini, dengan fokus pada studi kasus sekolah menengah di Mesir yang telah mengintegrasikan PBL dalam kurikulumnya. Data dikumpulkan melalui wawancara mendalam dengan guru dan siswa, observasi kelas, serta analisis proyek siswa, dokumen kurikulum, dan rencana pembelajaran. Hasil penelitian menunjukkan bahwa PBL secara signifikan meningkatkan pengalaman belajar, memotivasi siswa, dan mendorong keterlibatan aktif. Siswa yang terlibat dalam proyek kelompok menunjukkan pemahaman akademik yang lebih baik, kemampuan berpikir kritis yang lebih kuat, kepercayaan diri dalam presentasi, dan keterampilan kerja sama yang lebih baik. Namun, terdapat tantangan seperti keterbatasan sumber daya, kurangnya pelatihan guru, dan kurikulum yang berorientasi pada ujian. Guru sering menghadapi kesulitan dalam mengelola waktu untuk kegiatan berbasis proyek, dan keberhasilan PBL sangat bergantung pada kemampuan mereka dalam memfasilitasi pembelajaran. Untuk mengatasi hambatan ini, penelitian merekomendasikan peningkatan program pelatihan guru, adopsi kebijakan pendidikan yang lebih fleksibel, dan pemanfaatan teknologi untuk memperkaya dan mendiversifikasi kegiatan berbasis proyek. Dengan mengoptimalkan sumber daya yang ada dan meningkatkan kesadaran akan manfaat PBL, sistem pendidikan Mesir dapat lebih mempersiapkan siswa dengan keterampilan abad ke-21 yang esensial.

***Kata Kunci**: Strategi Pembelajaran, Keterampilan Praktis, Pendidikan Menengah*

Introduction

The current secondary education system in Egypt tends to emphasize mastery of theory over practical application, leading to students feeling unprepared to face the challenges they encounter in the workforce.[1] The excessive focus on theoretical aspects in the curriculum makes students less skilled in applying their knowledge in real-life situations, resulting in essential skills such as critical thinking and problem-solving not being fully developed.[2] In an era of globalization and rapid economic change, these skills are increasingly necessary for competing in a more competitive job market. Students must be able to analyze information, make sound decisions, and quickly adapt to changes in their work environments.[3] Therefore, it is crucial for the education system to prioritize the development of these practical skills so that students do not merely become rote learners of theory, but also individuals who can confidently and competently confront real-world challenges.

PBL has emerged as an effective teaching method for enhancing students' practical skills, with an approach that encourages students to actively engage in projects relevant to their daily lives. Through PBL, students not only learn theory but also have the opportunity to apply the knowledge they have acquired in real-world situations, which can deepen their understanding of the subject matter while honing their practical skills. This learning process teaches students to work in teams, communicate effectively, and resolve problems that arise during the project.[4] By collaborating in groups, students learn to appreciate different perspectives, strengthen their social skills, and understand the importance of teamwork in achieving common goals.[5] PBL also instills a sense of responsibility for their learning, as students are expected to plan, execute, and evaluate the projects they undertake. Therefore, the integration of PBL into the secondary education curriculum in Egypt is essential for better preparing students to face the challenges of the workforce and for developing skills that are relevant to the needs of an ever-changing world.

Through collaboration in groups, students learn to work together, communicate effectively, and overcome challenges presented during projects. This collaborative approach not only enhances their ability to navigate interpersonal dynamics but also instills a sense of accountability and ownership over their learning experiences. As students engage in PBL, they are encouraged to take initiative, think critically, and apply their knowledge in real-world contexts, which fosters deeper understanding and retention of the material. The active involvement in the learning process boosts their motivation and engagement, transforming education from a passive reception of information to a dynamic and meaningful exploration of concepts. Furthermore, by encountering and addressing various challenges during projects, students develop resilience and adaptability—skills that are crucial in today's rapidly changing world. The experiential nature of PBL cultivates an environment where learning becomes a shared journey, allowing students to learn from each other while cultivating essential

[1] Hosam Darwish, "Teachers' Attitudes And Techniques Towards Efl Writing In Egyptian Secondary Schools," *International Journal for 21st Century Education* 3, no. 1 (June 30, 2016): 37–57, https://doi.org/10.21071/ij21ce.v3i1.5646.

[2] Lisjeta Thaqi Jashari and Mateja Dagarin Fojkar, "Teachers' Perceptions of Developing Writing Skills in the EFL Classroom," *ELOPE: English Language Overseas Perspectives and Enquiries* 16, no. 2 (December 12, 2019): 77–90, https://doi.org/10.4312/elope.16.2.77-90.

[3] Michaela C. Pascoe, Sarah E. Hetrick, and Alexandra G. Parker, "The Impact of Stress on Students in Secondary School and Higher Education," *International Journal of Adolescence and Youth* 25, no. 1 (December 31, 2020): 104–12, https://doi.org/10.1080/02673843.2019.1596823.

[4] Shahira El Alfy, Jorge Marx Gómez, and Danail Ivanov, "Exploring Instructors' Technology Readiness, Attitudes and Behavioral Intentions towards e-Learning Technologies in Egypt and United Arab Emirates," *Education and Information Technologies* 22, no. 5 (September 6, 2017): 2605–27, https://doi.org/10.1007/s10639-016-9562-1.

[5] Ahmed Abdelhafez, "Experienced EFL Teachers' Professional Practical Knowledge, Reasoning and Classroom Decision Making in Egypt: Views from the inside Out," *Teacher Development* 18, no. 2 (April 3, 2014): 229–45, https://doi.org/10.1080/13664530.2014.901237.

soft skills such as teamwork, problem-solving, and effective communication.[6]

Despite the significant benefits associated with PBL, numerous challenges remain that can hinder its effective implementation in educational settings.[7]A primary concern is the lack of adequate training for teachers in applying PBL methodologies effectively, which can lead to inconsistent practices and a failure to maximize the approach's potential. Additionally, many schools face resource limitations that restrict access to necessary materials, technology, and support systems essential for carrying out comprehensive PBL initiatives. The rigid structure of the existing curriculum often prioritizes exam preparation and theoretical knowledge over practical applications, resulting in a reluctance to embrace PBL as a viable teaching method. These barriers can create an educational environment that stifles innovation and restricts students' ability to develop the practical skills they need to succeed in an increasingly competitive job market. To overcome these challenges, it is imperative that educators, administrators, and policymakers work collaboratively to provide the necessary resources, training, and structural support for PBL, thereby fostering a more enriching and effective educational experience for all students.

This research aims to identify the key elements in the implementation of PBL that can significantly contribute to the development of practical skills among students, including but not limited to creativity, problem-solving, and collaboration, while simultaneously evaluating the impact of PBL on students' learning motivation and academic achievement. The research conducts an in-depth investigation into these challenges, intending to formulate actionable recommendations and best practices that can empower educators to overcome these barriers and maximize the effectiveness of project-based teaching methodologies. The significance of this research is further underscored by its focus on providing in-depth insights into the application of PBL within the specific context of education in Egypt, where the educational landscape is undergoing transformative changes aimed at fostering innovation and skill development among students. Thus, this research aspires to bridge the gap between theoretical foundations and practical applications, ensuring that the educational experiences provided to students are both enriching and relevant, ultimately leading to the cultivation of a generation that is not only well-prepared to confront the myriad challenges of the globalized world but also adept at adapting swiftly to new circumstances and leveraging their acquired skills to succeed in various professional contexts.

Research Method

This study employs a qualitative approach with a case study design to deeply explore the implementation of PBL strategies as a means of enhancing students' practical skills in secondary education in Egypt. The participants consist of 6 teachers and 30 students room several secondary schools that have actively integrated PBL into their curricula, selected purposively based on their experience with this method and their involvement in PBL projects. Data collection is conducted through various techniques, including semi-structured in-depth interviews with both teachers and students to gain insights into their experiences, challenges, and perceptions regarding the implementation of PBL. Additionally, classroom observations will be carried out to examine student interactions, the teaching methods employed by teachers, and the group dynamics that emerge during PBL activities. Document analysis of curriculum materials and lesson plans will also be undertaken to assess the extent to which PBL is

[6] Nikolaos Pellas et al., "Augmenting the Learning Experience in Primary and Secondary School Education: A Systematic Review of Recent Trends in Augmented Reality Game-Based Learning," *Virtual Reality* 23, no. 4 (December 21, 2019): 329–46, https://doi.org/10.1007/s10055-018-0347-2.

[7] Shaimaa Abdul Salam Abdul Salam Selim, "Integrating Sustainable Development Requirements into the Secondary Stage Chemistry Curriculum in Egypt," *Journal of Teacher Education for Sustainability* 21, no. 2 (December 1, 2019): 139–54, https://doi.org/10.2478/jtes-2019-0022.

integrated into formal curricula and how it impacts the teaching and learning process. To complement this, a well-designed questionnaire will be distributed to students to gather quantitative data regarding their motivation, engagement levels, and perceived improvements in practical skills after participating in PBL projects. The collected data from interviews, observations, and document analyses will be analyzed using thematic analysis, where data coding will be performed to identify emerging themes and patterns. The findings of this research are expected to provide comprehensive insights into the positive effects of PBL on students' practical skills, as well as the challenges faced in its implementation. Consequently, this study aims to generate relevant recommendations for teachers and educational policymakers in Egypt, with the hope of optimizing the implementation of PBL within the context of secondary education to produce students who are better prepared to face real-world challenges.

Finding and Discussion

Finding

Effectiveness of Project-Based Learning (PBL) in Skill Development

This section will examine how Project-Based Learning (PBL) cultivates crucial practical skills in students, including critical thinking, problem-solving, teamwork, and effective communication. It will also analyze particular instances of successful PBL applications in secondary schools across Egypt, emphasizing the connection between involvement in real-world projects and the development of these skills.[8] The discussion may incorporate quantitative data from assessments that measure students' skill levels before and after engaging in PBL, illustrating its effectiveness in equipping students for future challenges.

Implementing Project-Based Learning (PBL) within educational environments, especially in Egyptian secondary schools, poses a considerable challenge due to the differences in implementation quality seen in various schools and classrooms. These inconsistencies arise from several factors, such as the teachers' expertise, the resources available in schools, and the extent of institutional support for innovative teaching practices. In numerous cases, the training and familiarity of teachers with PBL approaches vary widely, resulting in disparities in the effectiveness of PBL execution. For instance, while some educators may have received extensive training in PBL techniques, enabling them to craft engaging and relevant projects that foster critical thinking and problem-solving skills, others who lack this training may find it difficult to implement PBL effectively. Consequently, poorly structured projects may fail to engage students or enhance their practical skills. This inconsistency can create unequal learning environments, where some students excel while others miss critical learning opportunities, ultimately impeding their overall skill development.

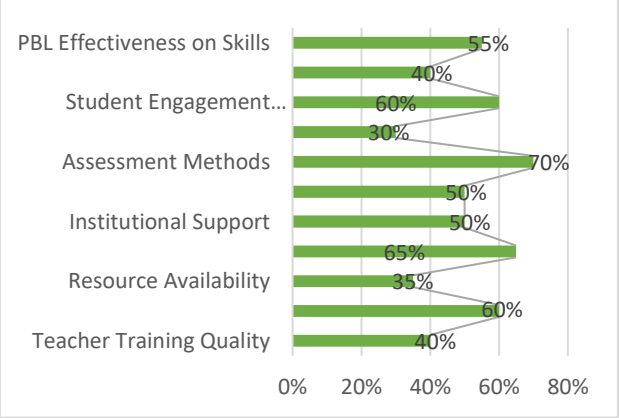

Figure 1. Variability in Implementing Project-Based Learning

Another significant concern associated with the variability in PBL implementation is the challenges in assessment and evaluation related to measuring the practical skills gained through project-based experiences. Conventional assessment methods, which typically rely on standardized testing and written exams, may not sufficiently capture the intricate skills that PBL aims to cultivate, such as teamwork, collaboration, and effective communication. This gap presents considerable challenges for educators seeking to

[8] Dimitra Kokotsaki, Victoria Menzies, and Andy Wiggins, "Project-Based Learning: A Review of the Literature," *Improving Schools* 19, no. 3 (November 24, 2016): 267–77, https://doi.org/10.1177/1365480216659733.

evaluate the true impact of PBL on student skill development. The inability to accurately measure these skills complicates the provision of persuasive evidence demonstrating the effectiveness of PBL in enhancing students' learning outcomes. [9] Furthermore, educators may face difficulties in balancing formative assessments, which are conducted continuously throughout the learning process for ongoing feedback, with summative assessments that evaluate overall performance at the end of a project. If formative assessments are not properly integrated into the PBL framework, educators might overlook the significance of the skills students acquire through collaborative efforts, complicating the assessment process further

In addition to assessment difficulties, student engagement and motivation represent another critical issue in the implementation of PBL.[10] While PBL is designed to boost student engagement by encouraging active participation through real-world projects, it does not always appeal to every learner. Several factors, including students' past educational experiences, their interests in the subject matter, and their individual learning styles, can significantly impact their motivation to participate in project-based activities. [11] For example, students accustomed to traditional, teacher-centered instruction may find it challenging to adapt to a PBL environment that demands greater independence and collaboration. As a result, these students may struggle to see the relevance of classroom projects to real-world applications, leading to disengagement and a lack of ownership over their learning.

To enhance the effectiveness of PBL in developing skills, it is essential for educators to recognize and cater to the diverse needs and motivations of their students. [12] This requires tailoring project tasks to fit various learning styles and interests, ensuring that each student feels included and adequately challenged. For example, teachers could allow students to choose project topics that resonate with their interests or provide alternative pathways for completing assignments based on their strengths. By implementing these strategies, educators can create a greater sense of relevance and purpose in students' work, ultimately boosting their engagement and motivation levels. Additionally, giving students opportunities to reflect on their learning experiences and express how the skills they have acquired through PBL relate to real-world contexts can further underscore the significance of project-based learning in their educational journeys.

Challenges in Implementing PBL in Egyptian Secondary Education

Challenges in Implementing Project-Based Learning (PBL) in Egyptian secondary education present significant hurdles for educators striving to integrate this innovative teaching approach into their curricula.[13] One of the primary obstacles is the limited training available for teachers regarding PBL methodologies. Many educators have been prepared through traditional pedagogical methods, which often emphasize rote memorization and standardized testing. As a result, they may feel ill-equipped to facilitate project-based learning experiences that require a shift towards student-centered instruction, collaboration, and critical

[9] Pengyue Guo et al., "A Review of Project-Based Learning in Higher Education: Student Outcomes and Measures," *International Journal of Educational Research* 102 (2020): 101586, https://doi.org/10.1016/j.ijer.2020.101586.

[10] Shao-Chen Chang and Gwo-Jen Hwang, "Impacts of an Augmented Reality-Based Flipped Learning Guiding Approach on Students' Scientific Project Performance and Perceptions," *Computers & Education* 125 (October 2018): 226–39, https://doi.org/10.1016/j.compedu.2018.06.007.

[11] Margaret E. Beier et al., "The Effect of Authentic Project-based Learning on Attitudes and Career Aspirations in STEM," *Journal of Research in Science Teaching* 56, no. 1 (January 21, 2019): 3–23, https://doi.org/10.1002/tea.21465.

[12] Mohammed Abdullatif Almulla, "The Effectiveness of the Project-Based Learning (PBL) Approach as a Way to Engage Students in Learning," *Sage Open* 10, no. 3 (July 5, 2020), https://doi.org/10.1177/2158244020938702.

[13] Abdel Nasser Ataya and Essam Ramadan, "Level of Organizational Health in Secondary Schools from the Viewpoint of Teachers of the General Secondary Education in Egypt," *Nasser Ataya, Abdel, Ramadan, Essam* 27, no. 5 (May 2013): 1069–1108, https://doi.org/10.35552/0247-027-005-006.

thinking.[14] Without adequate training, teachers may struggle to design and implement PBL activities effectively, leading to inconsistent experiences for students and ultimately undermining the potential benefits of PBL.

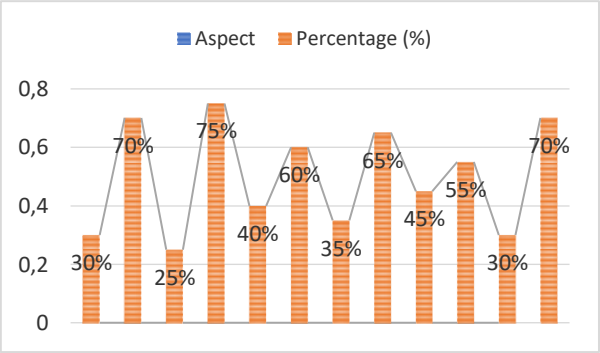

Figure 2. Project-Based Learning in Egyptian Secondary Schools

In addition to the lack of teacher training, insufficient resources and materials pose a significant challenge to the successful implementation of PBL in Egyptian secondary schools. Effective project-based learning often relies on access to various materials and resources, including technology, tools for research, and materials for hands-on activities. However, many schools in Egypt face budget constraints and inadequate funding, limiting their ability to provide the necessary resources for PBL. This scarcity can hinder teachers' efforts to create engaging and meaningful projects, ultimately impacting student motivation and learning outcomes.[15] Furthermore, the reliance on outdated textbooks and a lack of modern educational technology can create an environment that does not support the dynamic, interactive nature of PBL, making it difficult for educators to fully embrace this teaching methodology.

Another significant challenge is the pressure exerted by a rigid curriculum focused primarily on examination performance. In Egypt, educational policies often prioritize standardized testing as a measure of student achievement and institutional effectiveness. This emphasis on high-stakes exams can create a climate in which teachers feel compelled to teach to the test, limiting their willingness to adopt PBL strategies that may not align neatly with the prescribed curriculum. The result is a conflict between the goals of PBL such as fostering creativity, collaboration, and problem-solving skills and the demands of a system that prioritizes memorization and exam readiness. Consequently, educators may find it challenging to integrate PBL into their teaching without sacrificing the content that students are expected to master for examinations.

Additionally, the traditional classroom environment in many Egyptian secondary schools may not be conducive to the implementation of PBL. Conventional teaching practices often emphasize direct instruction, with teachers as the primary sources of knowledge, leading to passive learning experiences for students. This approach can create barriers to the active engagement required for successful project-based learning. For PBL to be effective, it is essential for classrooms to foster an atmosphere of collaboration, discussion, and hands-on exploration, which may be a departure from the norm in many educational settings. Teachers must not only adapt their instructional methods but also encourage students to take an active role in their learning, which can be a significant cultural shift for both educators and learners.

Addressing these challenges necessitates systemic changes in teacher training programs and educational policies to facilitate the effective implementation of PBL. Teacher training programs must incorporate comprehensive professional development opportunities focused on PBL methodologies, equipping educators with the knowledge and skills to design and facilitate

[14] Hania Sobhy, "The De-Facto Privatization of Secondary Education in Egypt: A Study of Private Tutoring in Technical and General Schools," *Compare: A Journal of Comparative and International Education* 42, no. 1 (January 2012): 47–67, https://doi.org/10.1080/03057925.2011.629042.

[15] Dewi Nurpitriyani et al., "Formal Education in Indonesia and Egypt: Comparison of Challenges in Teaching English on Secondary Level," *Tell : Teaching of English Language and Literature Journal* 10, no. 1 (April 30, 2022): 22, https://doi.org/10.30651/tell.v10i1.9408.

meaningful projects.[16] Additionally, educational policies should prioritize resource allocation for schools, ensuring that teachers have access to the materials and technologies necessary for successful PBL implementation. Finally, shifting the assessment focus from traditional high-stakes exams to more holistic measures of student learning will be crucial in creating an educational environment that supports PBL.[17] By recognizing and addressing these challenges, stakeholders in Egyptian education can work towards creating a more innovative and effective learning experience for students, ultimately better preparing them for the demands of the 21st century.

The role of collaboration and student engagement in Project-Based Learning

PBL is pivotal in shaping the educational experience for students.[18] PBL fundamentally transforms the learning environment from a traditional, teacher-centered model to one that promotes active participation and cooperation among peers. This shift encourages students to engage deeply with the material as they work together on projects that require input, discussion, and negotiation of ideas.[19] By actively participating in collaborative group work, students not only enhance their understanding of the subject matter but also develop essential interpersonal skills that are crucial in both academic and professional settings.

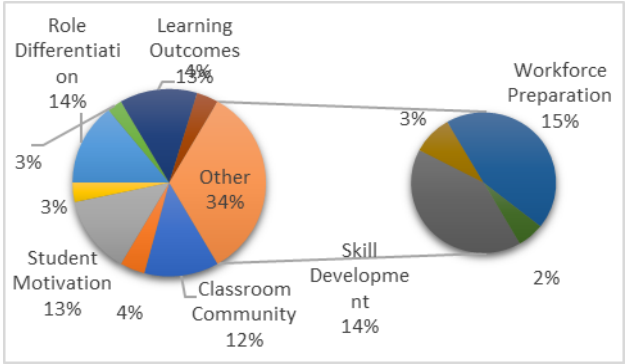

Figure 3. The Impact of Collaboration in Project-Based Learning on Student

One of the significant benefits of collaboration in PBL is the creation of a sense of community within the classroom. When students collaborate on projects, they form bonds and relationships that foster an environment of trust and mutual respect.[20] This supportive atmosphere can be particularly beneficial for students who may feel isolated or marginalized in traditional learning environments. As they engage in discussions, share ideas, and provide feedback to one another, students cultivate a shared sense of responsibility for their learning and the success of their group projects. This collective effort enhances their commitment to the task at hand, resulting in deeper learning experiences that go beyond surface-level understanding.

The impact of collaboration on student motivation is also noteworthy. In PBL settings, students often feel a heightened sense of ownership over their learning, as they have a direct stake in the outcomes of their projects. The collaborative nature of PBL allows students to take on various roles within their groups, enabling them to contribute their unique strengths and skills. This

[16] Khaled Salah Hanafy Mahmoud, "The Development of the Egyptian Technical Secondary Education Considering Some Contemporary Global Trends: An Analytical Study," *European Journal of Social Science Education and Research* 5, no. 3 (2019): 23–31, https://doi.org/10.2478/ejser-2018-0054.

[17] Gholamreza Arabsheibani, "Educational Choice and Achievement: The Case of Secondary Schools in the Arab Republic of Egypt," *Higher Education* 17, no. 6 (1988): 637–46, https://doi.org/10.1007/BF00143779.

[18] Dua' Ghosheh Wahbeh et al., "The Role of Project-Based Language Learning in Developing Students' Life Skills," *Sustainability* 13, no. 12 (June 8, 2021): 6518, https://doi.org/10.3390/su13126518.

[19] Ünal Çakiroğlu and Turgay Erdemir, "Online Project Based Learning via Cloud Computing: Exploring Roles of Instructor and Students," *Interactive Learning Environments* 27, no. 4 (May 19, 2019): 547–66, https://doi.org/10.1080/10494820.2018.1489855.

[20] A. Aranzabal, E. Epelde, and M. Artetxe, "Team Formation on the Basis of Belbin's Roles to Enhance Students' Performance in Project Based Learning," *Education for Chemical Engineers* 38 (January 2022): 22–37, https://doi.org/10.1016/j.ece.2021.09.001.

role differentiation not only empowers students but also instills a sense of accountability to their peers, motivating them to engage more actively in the learning process. As they witness the results of their collective efforts, students are likely to experience increased motivation and satisfaction, reinforcing their desire to participate in future collaborative projects.

Additionally, feedback from students on their experiences with PBL reveals a strong correlation between collaborative projects and their learning outcomes. Many students express that working in groups enhances their understanding of complex concepts, as they benefit from diverse perspectives and insights. Collaborative projects often require students to articulate their thoughts, defend their ideas, and consider alternative viewpoints, which further enriches their learning experience. Furthermore, students frequently report that the skills they develop through collaboration such as communication, conflict resolution, and teamwork are not only valuable in the classroom but also crucial for success in real-world scenarios.[21] This feedback underscores the effectiveness of PBL in preparing students for future collaborative efforts in their careers and daily lives.

Finally, the emphasis on collaboration in PBL aligns well with the demands of the modern workforce, where teamwork and effective communication are essential. As students engage in project-based learning, they are exposed to realistic situations that mimic professional environments, where collaboration is often a key factor in achieving success. By navigating group dynamics, managing differing opinions, and working towards a common goal, students build a repertoire of skills that will serve them well in their future endeavors.[22] This experiential learning approach not only enhances their academic performance but also equips them with the competencies required to thrive in a collaborative world, making PBL an invaluable educational strategy in today's interconnected society.

Discussion

The use of collaborative platforms such as Google Workspace or Microsoft Teams provides significant ease in implementing project-based learning (PBL).[23] In the PBL process, students often need tools that support effective coordination and collaboration among team members, from the planning stage to project completion. With features like collaborative documents, calendars, and task reminders, students can easily organize task distribution and work schedules, ensuring that each team member contributes to the maximum.[24] These platforms also allow students to track project progress in real-time and adjust their strategies as needed. Additionally, with direct communication features like chat or video calls, students can quickly address issues or obstacles in their projects, enhancing team efficiency as well as their skills in collaboration and communication.

In today's information era, technology also opens up access for students to explore resources and information from various global sources, which is crucial for project-based research. Previously, limited access to information posed challenges in school projects, but with the internet, students can now obtain data, articles, scientific journals, and multimedia resources from around the world with just a few clicks. Access to these global resources not only broadens students' perspectives but also enables them to examine a

[21] Andrew J. Rohm, Matt Stefl, and Noriko Ward, "Future Proof and Real-World Ready: The Role of Live Project-Based Learning in Students' Skill Development," *Journal of Marketing Education* 43, no. 2 (August 22, 2021): 204–15, https://doi.org/10.1177/02734753211001409.

[22] Judith Morrison et al., "Teachers' Role in Students' Learning at a Project-Based STEM High School: Implications for Teacher Education," *International Journal of Science and Mathematics Education* 19, no. 6 (August 16, 2021): 1103–23, https://doi.org/10.1007/s10763-020-10108-3.

[23] Jane S. Vogler et al., "The Hard Work of Soft Skills: Augmenting the Project-Based Learning Experience with Interdisciplinary Teamwork," *Instructional Science* 46, no. 3 (June 28, 2018): 457–88, https://doi.org/10.1007/s11251-017-9438-9.

[24] Daniel Spikol et al., "Supervised Machine Learning in Multimodal Learning Analytics for Estimating Success in Project-based Learning," *Journal of Computer Assisted Learning* 34, no. 4 (August 15, 2018): 366–77, https://doi.org/10.1111/jcal.12263.

topic from a wider array of perspectives, including different cultural or disciplinary viewpoints. This allows them to understand the complexity of topics more deeply and critically. Furthermore, students learn to evaluate the quality and relevance of the information they find, developing essential information literacy skills for their learning and future career development.

Digital tools such as presentation software,[25] video editing applications, and infographic creators provide students with the opportunity to present their project outcomes in a more engaging, creative, and interactive manner. By using these tools, students can visually communicate their ideas or findings, which is often more effective and easier to understand than using text alone. The ability to create appealing visual presentations not only helps students convey information to their audience but also enhances their visual communication skills. For instance, by creating videos or infographics, students can hone their abilities to select key information, effectively organize visual elements, and capture audience attention. Additionally, the use of these tools allows students to develop technical skills that are valuable in today's digital world, such as basic design skills, video editing, and visual layout arrangement, which are an added value in preparing them for future job demands.

Incorporating technology into project-based learning (PBL) allows students to gain critical digital skills, such as technological literacy, data management, and ethical information use, which are highly relevant to modern workplace demands.[26] As students engage with various digital tools throughout the PBL process, they become proficient in navigating platforms, organizing data, and using technology responsibly.[27] For instance, they learn to assess the reliability of online sources, securely manage shared data, and apply ethical considerations when referencing materials. This exposure not only prepares students for academic projects but also builds a foundation for responsible digital citizenship and workplace readiness. Through these experiences, students enhance their ability to operate in a technology-driven world, making them more adaptable to changing digital landscapes and better equipped to handle future challenges in both personal and professional contexts.

Technology allows for a level of personalization in project-based learning that can greatly increase student engagement and understanding. By utilizing tailored applications, simulations, and interactive resources, students can explore content that aligns with their individual learning needs, preferences, or project requirements.[28] This customization enables a more meaningful exploration of topics, empowering students to take ownership of their learning journey and explore areas of interest more deeply. For instance, they might use simulations to visualize complex concepts, interactive applications to practice problem-solving, or virtual labs to experiment with scientific principles—all of which contribute to a richer, more immersive learning experience. Such tailored technological resources support diverse learning styles, promote sustained engagement, and encourage critical thinking, ultimately leading to a more impactful

[25] Sunyoung Han, Robert M. Capraro, and Mary M. Capraro, "How Science, Technology, Engineering, and Mathematics Project Based Learning Affects High-Need Students in the U.S.," *Learning and Individual Differences* 51 (October 2016): 157–66, https://doi.org/10.1016/j.lindif.2016.08.045.

[26] Ibrahim Bilgin, Yunus Karakuyu, and Yusuf Ay, "The Effects of Project Based Learning on Undergraduate Students' Achievement and Self-Efficacy Beliefs Towards Science Teaching," *EURASIA Journal of Mathematics, Science and Technology Education* 11, no. 3 (April 29, 2015), https://doi.org/10.12973/eurasia.2014.1015a.

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and comprehensive understanding of project topics.

Conclusion

The conclusion of this study on enhancing the implementation of Project-Based Learning (PBL) in Egyptian secondary education requires a collaborative effort from educators, policymakers, and school administrators. By prioritizing professional development, integrating technology, promoting flexible curricular policies, creating a supportive environment, and implementing effective assessment strategies, stakeholders can establish a robust framework for PBL that maximizes its potential to develop essential skills among students. Additionally, several recommendations can be applied to further improve PBL implementation, such as forming professional learning communities among educators to share best practices, providing specialized training for teachers on PBL methodologies, and integrating digital platforms that support collaboration on projects. Furthermore, building partnerships with local industries and communities will give students the opportunity to apply PBL in real-world contexts, while a continuous evaluation and feedback system can help monitor the effectiveness of PBL. Flexibility in scheduling and learning, as well as promoting the benefits of PBL to students and parents, are also crucial for garnering broader support. As the educational landscape continues to evolve, adopting these recommendations will be vital in preparing students to face the complexities of the modern world and equipping them with the necessary skills to succeed in their future endeavors. Through collaborative efforts and a commitment to innovation, the vision of an educational system that values experiential learning and practical skill development can be realized, ultimately benefiting both students and society as a whole.

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