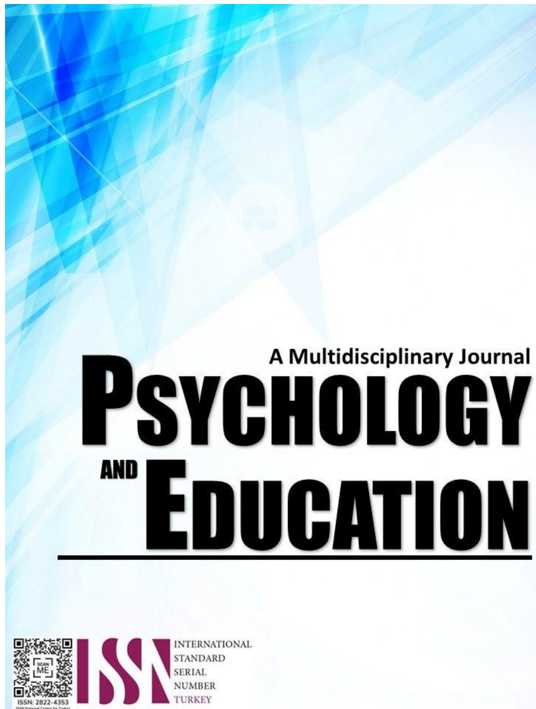
FOSTERING TECHNICAL PROFICIENCY THROUGH INNOVATION-BASED INSTRUCTION: A SUPPLEMENTARY APPROACH TO COMPETENCY-BASED CURRICULUM IN ELECTRONICS TECHNOLOGY



PSYCHOLOGY AND EDUCATION: A MULTIDISCIPLINARY JOURNAL

Volume: 35
Issue 9
Pages: 1062-1072
Document ID: 2025PEMJ3424
DOI: 10.70838/pemj.350908
Manuscript Accepted: 03-28-2025

Psych Educ, 2025, **35**(9): 1062-1072, Document ID:2025PEMJ3424, doi:10.70838/pemj.350908, ISSN 2822-4353
Research Article

Fostering Technical Proficiency through Innovation-Based Instruction: A Supplementary Approach to Competency-Based Curriculum in Electronics Technology

Dexter Louis P. Gialogo*
For affiliations and correspondence, see the last page.

Abstract

This study explored the effectiveness of innovation-based instruction (IBI) as a supplementary approach to a competency-based curriculum (CBC) in enhancing the technical proficiency of electronics technology students in the Philippines. Recognizing the gap between academic training and the dynamic demands of the electronics industry, the research examined how integrating project-based learning, digital tools, and real-world applications could improve students' technical skills, engagement, and career readiness. Using a descriptive-evaluative mixed-methods design, the study involved pre- and post-tests, focus group discussions, and interviews with 16 student respondents and several instructors. Quantitative results indicated a significant increase in students' technical competencies, with post-test scores rising to a "Highly Innovative" interpretation. Moreover, learner motivation and engagement improved substantially, reflecting increased involvement in practical activities and a stronger interest in real-world applications of electronics. The study also revealed that combining CBC and IBI methodologies aligned well with industry standards, boosting students' preparedness for employment. However, challenges such as limited technological resources and the need for continuous teacher training were noted. The findings emphasize the value of modern, interactive instructional approaches in technical education and suggest that schools invest in up-to-date equipment, provide faculty development, and strengthen industry-academic partnerships to sustain improvements. The study concludes that innovation-based teaching significantly enhances vocational readiness and should be systematically incorporated into electronics education to meet the evolving needs of the workforce.

Keywords: *innovation-based instruction, competency-based curriculum, technical proficiency, career readiness, electronics technology*

Introduction

As technology changes quickly, there is a greater need for skilled workers, especially in the electronics business. But there is a big difference between what vocational training graduates can do and what the business needs now and in the future. This study looks at this problem and finds out what happens when a Competency-Based Curriculum (CBC) is used in job training for electronics. Its main goal is to find out if teaching methods based on new ideas improve students' technical skills, job prospects, and desire to use what they learn in the real world.

Competency-based education (CBE) helps students get the skills employers want by encouraging them to think critically, be flexible, and be ready for work. Research by Mustikawanto (2019) and Khoerunnisa et al. (2020) showed how CBE can help students learn problem-solving skills that are important in technical fields. Other research by Tentama et al. (2019) and Ahmid (2023) shows that structured vocational education that includes hands-on and inquiry-based learning makes students more employable. Hahn & Gangeness (2019) and Doherty-Restrepo (2023) also showed that matching educational programs to industry needs helps students get jobs and encourages them to continue learning.

Effective education planning ensures lessons align with the evolving business world, preparing students for its dynamic nature. Internship and project-based learning provide hands-on experience, enhancing workplace readiness (Mayorga, 2019; Duprey & Dunker, 2021). These effects will be studied over two months, from December 4, 2024, to February 10, 2025, to assess vocational readiness and adaptability.

Further studies have looked at the problems with technical education and how well it fits with the needs of businesses. Mayorga (2019) stated that vocational classes teach students basic technical skills but do not always teach them how to adapt to new trends in the industry. Doherty-Restrepo (2023) discussed how training programs must be updated to include real-life uses and project-based learning to prepare students for work. Duprey and Dunker (2021) also found that vocational students in the Philippines gain a lot from hands-on training. However, they said current curricula must be changed to meet global standards. These gaps mean that how we train learners now needs to be looked at again, better to prepare them for jobs in the electronics industry.

This study is important for determining why practical education does not match employers' requirements. Because the electronics business is constantly changing, it is needed to find ways to teach that improve both technical skills and the ability to think critically. The study aimed to determine if the CBC structure, which uses constructionist and inquiry-based methods, makes students more motivated and ready for work. By looking at how well innovation-based instruction works, the study aims to give educational policymakers and training schools useful information.

Research Questions

This study evaluated and determined how combined instruction bodies develop skills, engagement, and vocational readiness as they applied to the electronics industry in the Philippines. Specifically, this sought to answer the following:

1. To what extent does innovation-based instruction affect the technical skills of electronics technology students in terms of pre-test and post-test?
2. To what extent do innovation-based techniques, influenced by their delivery methods, impact the motivation and involvement of learners in competency-based instruction?
3. To what extent does integrating innovation-based and competency-based instructional strategies improve career readiness in electronics?
4. What challenges and opportunities do the instructor face when implementing innovative instructional methods within the competency-based curriculum?
5. Does a supplementary approach effectively meet the diverse needs of the electronics industry in the Philippines?

Methodology

Research Design

This study utilized a descriptive-evaluative-methods design, incorporating both qualitative and quantitative approaches to measure the impact of innovation-based instruction and competency-based curriculum (CBC) on technical competence in electronics technology among students. The quantitative component involves pre- and post-test measurements on the students taught solely competency-based and innovation-based instructional strategies. The qualitative component includes interviews, focus group discussions, and observations to explore students' and instructors' experiences, perceptions, and challenges in the innovation-based instructional approach.

The study started by selecting the target respondents. A pre-test was administered to get baseline data on their technical abilities. Firstly, the learners were taught a traditional competency-based curriculum with no additional activities. Then, after the activity, the learners will receive instructional innovation, such as project-based learning and real-world scenario exercises. In addition, qualitative data will be collected through focus groups with experimental students, interviews with instructors, observations, and course content analysis. Data analysis included testing the null hypothesis for significant changes in pre-and post-test scores between groups and thematic analysis to identify recurring themes in instructional design that promote engagement and alleviate problems.

Correspondingly, a descriptive-evaluative design was used to assess the effectiveness of the Innovation-Based Instruction as a supplementary approach to the technical proficiency of the electronics students. The data collected were organized, summarized, and analyzed to address the specific research questions drawn from the problem statement. This research design typically aims to compare using pre-test and post-test data and assess the reliability of the results. It also measures changes resulting from experimental treatments, focusing on dimensions such as technical skills or proficiency of the electronics students.

Respondents

The study respondents included two main groups: students and teachers. The students' group comprises electronics technology students from two parallel classes, with approximately 16 participants selected as electronics students. The teachers' group includes electronics technology teachers teaching competency- or innovation-based instruction. Two to three instructors will be interviewed based on their familiarity with the implemented approaches, their perceptions of the impacts on their students, and the reasons underlying their chosen instructional methods.

Moreover, the panel of evaluators were classified as Doctor of Education in the electronics field. They will be research enthusiasts who analyzed, evaluated, and validated the Innovation-Based Instruction as a supplementary approach to developing non-biased, valid, and reliable material.

Procedure

The data-gathering procedure is a systematic and structured approach to collecting data for research purposes. It ensures that the data collected is reliable, valid, and aligned with the research objectives, enabling researchers to draw meaningful conclusions and make informed decisions based on the findings.

Results and Discussion

This section presents, analyzes, and interprets the data from the respondents' responses on fostering technical proficiency through innovation-based instruction: a supplementary approach to competency-based curriculum in electronics technology.

The table shows that, with a mean score of 3.532 and a standard deviation of 0.408, the degree of innovation-based instruction in advancing the technical skills of students studying electronics technology is considered moderate. The results indicate a "Moderately Innovative" interpretation, suggesting that although specific innovative teaching methods are employed, they have not been fully optimized for student learning.

The findings are consistent with Guadalupe et al. (2023), who highlighted that innovation-based instruction improves technical skills, contingent upon resource availability and effective implementation. Yang et al. (2018) emphasized that technology-enhanced learning plays a crucial role in competency development, necessitating ongoing alignment with industry standards. The Asian Development Bank (2021) indicated that numerous technical education programs in Asia encounter difficulties adopting innovation-based approaches, primarily due to inadequate infrastructure and obsolete teaching methods.

Table 1. *The Extent of Innovation-Based Instruction that Affects the Technical Skills of Electronics Technology Students in terms of Pre-Test*

	Indicator	*Mean*	*Std. Deviation*	*Description*	*Interpretation*
1.	I feel confident in understanding basic technical concepts in electronics.	3.625	0.484	Moderately Innovative	Evident in most instructional practices
2.	My current learning method is effective for developing my technical skills.	3.625	0.484	Moderately Innovative	Evident in most instructional practices
3.	I frequently engage in hands-on activities to practice electronics skills.	3.563	0.496	Moderately Innovative	Evident in most instructional practices
4.	I am prepared to apply my technical skills in real-world electronics.	3.563	0.496	Moderately Innovative	Evident in most instructional practices
5.	I believe I am developing the necessary technical skills for a career in electronics.	3.563	0.496	Moderately Innovative	Evident in most instructional practices
6.	I have a good understanding of the functions of basic electronic components.	3.500	0.500	Moderately Innovative	Evident in most instructional practices
7.	I am satisfied with the technical skills I have gained in this course.	3.500	0.500	Moderately Innovative	Evident in most instructional practices
8.	I am comfortable using tools and equipment for electronic work.	3.500	0.500	Moderately Innovative	Evident in most instructional practices
9.	I can effectively apply my knowledge to solve technical problems in electronics.	3.438	0.496	Minimally Innovative	Rarely used in instructional practices
10.	I am confident in my ability to troubleshoot and repair electronic equipment.	3.438	0.496	Minimally Innovative	Rarely used in instructional practices
		3.532	0.408	Moderately Innovative	Evident in most instructional practices

Although students gain from innovation-based instruction, opportunities for enhancement remain. Teachers must enhance hands-on training, incorporate emerging technologies, and foster robust partnerships between industry and academia to connect theoretical knowledge with practical applications effectively. Addressing resource limitations and updating instructional strategies is essential for comprehensively developing students' technical competencies in electronics technology.

Table 2. *The Extent of Innovation-Based Instruction that Affects the Technical Skills of Electronics Technology Students in terms of Post-Test*

	Indicator	*Mean*	*Std. Deviation*	*Description*	*Interpretation*
1.	I believe I am developing the necessary technical skills for a career in electronics.	4.813	0.390	Highly Innovative	Strongly evident in instructional practices.
2.	I can effectively apply my knowledge to solve technical problems in electronics.	4.750	0.433	Highly Innovative	Strongly evident in instructional practices.
3.	I am confident in my ability to troubleshoot and repair electronic equipment.	4.688	0.464	Highly Innovative	Strongly evident in instructional practices.
4.	I feel confident in understanding basic technical concepts in electronics.	4.625	0.484	Highly Innovative	Strongly evident in instructional practices.
5.	My current learning method is effective for developing my technical skills.	4.500	0.500	Highly Innovative	Strongly evident in instructional practices.
6.	I am prepared to apply my technical skills in real-world electronics.	4.438	0.496	Moderately Innovative	Evident in most instructional practices
7.	I have a good understanding of the functions of basic electronic components.	4.375	0.484	Moderately Innovative	Evident in most instructional practices
8.	I am comfortable using tools and equipment for electronic work.	4.375	0.484	Moderately Innovative	Evident in most instructional practices
9.	I frequently engage in hands-on activities to practice electronics skills.	4.375	0.484	Moderately Innovative	Evident in most instructional practices
10.	I am satisfied with the technical skills I have gained in this course.	4.313	0.464	Moderately Innovative	Evident in most instructional practices
		4.525	0.468	Highly Innovative	Strongly evident in

				instructional practices.

The table shows that, based on the post-test, innovation-based teaching improved the technical skills of electronics technology students (with a mean score of 4.525 and a standard deviation of 0.468). The results are interpreted as "Highly Innovative", which means that innovation-based teaching has made a big difference in students' technical skills, ability to solve problems, and confidence in using what they have learned in the real world.

The results support what Kiong (2023) said about how hands-on and technology-based teaching methods make technical education more engaging and help students learn new skills. In the same way, Duterte (2024) said that incorporating new technologies and uses from the real world into the curriculum makes learning more effective and prepares students for what employers want. Lopez and Santiago (2020) agreed with this idea as well. They said that progressive teaching methods connect academic knowledge to real-world applications. This makes learning more meaningful and valuable in the workplace.

The results show that innovation-based teaching is a good way for electronics technology students to learn new technical skills. Teachers should continue to use progressive teaching methods, like hands-on activities, real-life applications, and new tools. Students will be even better prepared for future jobs in electronics if partnerships with businesses are strengthened and the curriculum is constantly updated to keep up with technological changes.

Table 3. *The Extent of Innovation-Based Instruction that Influences the Innovation-Based Delivery Method on Learner Motivation and Engagement in terms of Pre-Test*

Indicator	*Mean*	*Std. Deviation*	*Description*	*Interpretation*
1. I feel involved during hands-on activities or practical work.	3.688	0.464	Moderately Innovative	Evident in most instructional practices
2. I enjoy using innovative teaching methods (e.g., simulations and digital tools) in my lessons.	3.688	0.464	Moderately Innovative	Evident in most instructional practices
3. I feel motivated to participate in class activities actively.	3.625	0.484	Moderately Innovative	Evident in most instructional practices
4. I often feel engaged during class discussions.	3.625	0.484	Moderately Innovative	Evident in most instructional practices
5. I feel confident in learning independently using online resources and tools.	3.625	0.484	Moderately Innovative	Evident in most instructional practices
6. I find my current electronics lessons interesting.	3.563	0.496	Moderately Innovative	Evident in most instructional practices
7. I feel engaged when lessons include real-world applications of electronics.	3.375	0.484	Minimally Innovative	Rarely used in instructional practices
8. I regularly use technology (e.g., digital tools and online resources) in my learning.	3.375	0.484	Minimally Innovative	Rarely used in instructional practices
9. Innovation-based instruction helps me grasp complex concepts effectively.	3.375	0.484	Minimally Innovative	Rarely used in instructional practices
10. I am motivated to complete assignments or projects in my electronics course.	3.250	0.433	Minimally Innovative	Rarely used in instructional practices
	3.519	0.525	Moderately Innovative	Evident in most instructional practices

The table shows that innovation-based teaching moderately affected student motivation and engagement, as shown by the mean score of 3.519 and the standard deviation of 0.525 on the pre-test. The results are interpreted as "Moderately Innovative," which means there are new ways of teaching (like simulations, digital tools, and real-world applications) in the learning environment. However, they are not yet fully optimized to get the most out of them in terms of motivation and engagement.

The results support what Lin et al. (2017) said about how digital tools and engaging teaching methods can make students more interested, but how well they are used in the learning process determines how well they work. Similarly, Balalle (2024) discovered that students like new ways of teaching but might need more help and experience to participate fully in the learning process. However, Shodipe and Ohanu (2020) said that traditional teaching methods still significantly impact student enthusiasm, especially when mixed with new technology-based lessons to balance the approach.

The results show that innovation-based teaching motivates and interest students, but more is needed to improve it. Teachers should look for better ways to use digital tools, real-life uses, and hands-on teaching methods in the classroom. Giving kids more hands-on activities, game-based learning methods, and group projects could interest them. Additionally, ongoing training for teachers and the creation of new resources are necessary to ensure that new teaching methods are used effectively.

The table 4 shows that innovation-based teaching greatly affected students' motivation and engagement, as shown by the mean score of 4.556 and the standard deviation of 0.478 on the post-test. The interpretation of the results is "Highly Innovative," which means that new ways of teaching, like using digital tools, real-life applications, and interactive learning strategies, have made students much more interested, motivated, and involved in the learning process.

The results agree with those of Qoshirotutthorfi et al. (2024), who discovered that using technology to increase learning in vocational education makes students much more interested and helps them learn technical skills. In the same way, Henderson et al. (2015) stressed that using digital tools in teaching engineering and electronics helps students understand concepts better and motivates them more. Yeşilyurt and Vezne (2023) also said that problem-based, hands-on learning in electronics classes makes it easier for students to use what they have learned in the classroom in the real world, which leads to more involvement and better technical skills.

Table 4. *The Extent of Innovation-Based Instruction that Influences the Innovation-Based Delivery Method on Learner Motivation and Engagement in terms of Post-Test*

	Indicator	*Mean*	*Std. Deviation*	*Description*	*Interpretation*
1.	I regularly use technology (e.g., digital tools and online resources) in my learning.	4.813	0.390	Highly Innovative	Strongly evident in instructional practices.
2.	I often feel engaged during class discussions.	4.750	0.433	Highly Innovative	Strongly evident in instructional practices.
3.	I feel involved during hands-on activities or practical work.	4.625	0.484	Highly Innovative	Strongly evident in instructional practices.
4.	I am motivated to complete assignments or projects in my electronics course.	4.563	0.496	Highly Innovative	Strongly evident in instructional practices.
5.	I feel engaged when lessons include real-world applications of electronics.	4.500	0.500	Highly Innovative	Strongly evident in instructional practices.
6.	I feel confident in learning independently using online resources and tools.	4.500	0.500	Highly Innovative	Strongly evident in instructional practices.
7.	I enjoy using innovative teaching methods (e.g., simulations and digital tools) in my lessons.	4.500	0.500	Highly Innovative	Strongly evident in instructional practices.
8.	I find my current electronics lessons interesting.	4.500	0.500	Highly Innovative	Strongly evident in instructional practices.
9.	Innovation-based instruction helps me grasp complex concepts effectively.	4.438	0.496	Moderately Innovative	Evident in most instructional practices
10.	I feel motivated to participate in class activities actively.	4.375	0.484	Moderately Innovative	Evident in most instructional practices
		4.556	0.478	Highly Innovative	Strongly evident in instructional practices.

The results show that innovation-based teaching is a good way to get students more interested and motivated in Electronics Senior High School programs. Teachers should continue using digital tools, simulations, and real-world applications to keep student interest high. Also, workshop- and project-based learning should be stressed to improve technical skills even more. To help students learn by doing, schools should also buy new learning management systems and electronic lab tools. In the future, researchers may look into how progressive teaching methods affect students' long-term performance, results on certification exams, and ability to find work in the electronics industry.

Table 5. *The Extent of Integrating Innovation-Based and Competency-Based Instructional Strategies to Improve Career Readiness in Electronics*

	Indicator	*Mean*	*Std. Deviation*	*Description*	*Interpretation*
1.	My current education aligns well with industry standards and practices.	4.813	0.390	Very High	Highly career-ready
2.	I feel well-prepared for a career in electronics technology after completing this course.	4.750	0.433	Very High	Highly career-ready for career demands
3.	My technical skills meet the career expectations in electronics technology.	4.563	0.496	Very High	Highly career-ready for career demands
4.	I am confident in applying my electronics skills in a professional environment.	4.500	0.500	Very High	Highly career-ready for career demands
5.	The combined instructional strategies prepare me for real-world electronics challenges.	4.438	0.496	High	Well-prepared for career demands
6.	The skills I am learning are highly relevant to real-world electronic work.	4.375	0.484	High	Well-prepared for career demands
7.	I am confident in understanding the expectations of employers in the electronics industry.	3.688	0.464	High	Well-prepared for career demands
8.	I feel ready to work in a team within a professional electronics environment.	3.563	0.496	High	Well-prepared for career demands
9.	My current curriculum effectively prepares me for the demands of the electronics industry.	3.375	0.484	Moderate	Moderately career ready: requires further training.

10.	My coursework places significant emphasis on real-world industry applications.	3.375	0.484	Moderate	Moderately career ready: requires further training.
		4.594	0.473	Very High	Highly career-ready for career demands

The table shows that combining innovation-based and competency-based teaching methods makes students much more prepared for careers in electronics technology, with an overall mean score of 4.594 (Very High). The best indicators, like curriculum alignment with industry standards (M=4.813) and feeling well-prepared for a job in electronics (M=4.750), show that these teaching methods are good at getting students ready for what the real-world needs.

These results agree with what Mulder (2016) said about how competency-based education fills the gap between what you learn in school and what is expected of you at work. Similarly, Yawman and Appiah-Kubi (2018) said that combining hands-on learning with training relevant to the workplace makes students more employable in technical areas. On the other hand, Sin and Hussin (2024) say that these teaching methods help students prepare for careers. However, they only work if businesses work together and the material is constantly updated.

The results show that improving innovation-based and competency-based teaching is the most important thing that can be done to make students more ready for careers in electronics technology. To ensure that students are fully prepared for the needs of the electronics industry, schools should improve these tactics even more by forming more partnerships with businesses, keeping courses up to date with new technologies, and adding more real-world applications.

Table 6. *The Summary Responses of Challenges and Opportunities of the Instructors Faced in Implementing Innovative Instructional Methods*

	Indicator	*Mean*	*Std. Deviation*	*Description*	*Interpretation*
1.	My teacher(s) often adapt their teaching approach to suit diverse learning styles.	4.625	0.484	Very High	Highly Evident
2.	My teacher(s) are supportive in helping me understand complex electronic concepts.	4.563	0.496	Very High	Highly Evident
3.	My teacher(s) is/are well-prepared to implement innovative teaching methods.	4.500	0.500	High	Evident
4.	My teacher(s) give me sufficient freedom to choose learning methods (e.g., hands-on, theoretical).	4.375	0.484	High	Evident
5.	I am confident in my teacher(s)' ability to address the challenges of innovation-based instruction.	4.313	0.464	High	Evident
6.	My teacher(s) effectively balance traditional and innovative methods in electronics education.	4.313	0.464	High	Evident
7.	I feel comfortable asking my teacher(s) for help when learning new concepts.	3.688	0.464	Moderate	Moderately Evident
8.	My teacher(s) is/are satisfied with the resources available for hands-on activities and innovative learning.	3.563	0.484	Moderate	Moderately Evident
9.	My teacher(s) effectively use technology in teaching.	3.438	0.496	Moderate	Moderately Evident
10.	My teacher(s) effectively balance traditional and innovative methods in electronics education.	3.500	0.500	Moderate	Moderately Evident
		4.078	0.484	High	Evident

The table shows that teachers often face challenges and opportunities when using new teaching methods, with a high general level of practices (M = 4.078, SD = 0.484). The highest-rated signs show that teachers change how they teach (M = 4.625) and help students understand challenging ideas (M = 4.563), showing that they are flexible and interested in how they teach. Some things were indistinct, like being satisfied with the available resources (M = 3.563) and using technology well (M = 3.438). This suggests that some problems may still be stopping the entire application.

This aligns with what Mulder (2016b) said about how competency-based instruction must be backed up by constant innovation and flexibility to meet job readiness needs. In the same way, Celeste and Osias (2024) say that even though teachers agree that new ways of teaching are helpful, it is still hard for them to access up-to-date materials. Açıkgöz and Babadoğan (2021) say that for educational innovation to work, teachers need to be trained and there needs to be a place where people can try new things and use technology.

The results show that even though teachers are using new ways of teaching, they are still having trouble with resources, getting help from the school, and incorporating technology.

For innovation-based teaching to be fully used, institutions should improve their faculty development programs, buy more technology, and make rules that promote new ways of teaching. This will ensure that electronics teachers can prepare their students well for the needs of a changing field.

The table 7 displays that the extra teaching method used in electronics classes is thought to meet the needs of the business, with a mean score of 4.450 (Effective). Teachers' ability to adapt to different learning styles (M = 4.625) and help students understand challenging electronic ideas (M = 4.563) are two of the most highly rated indicators that show teachers' responsiveness to industry-aligned education. The approach also fits with what employers expect today, as shown by the use of new teaching methods and the integration of technology (M = 4.313–4.500).

This result fits what Mulder (2016) said about how important competency-based education is for preparing students for workplace demands. Celeste and Osias (2024) also say that strong relationships with businesses and relevant curriculum changes help students prepare for careers. Ikwumelu et al. (2015) also say that industry-aligned skills are best learned through practical, hands-on teaching. Qoshirotutthorfi et al. (2024) say that constant changes to the curriculum are necessary to keep up with changing technical needs.

Table 7. *The Effectiveness of a Supplementary Instructional Approach for Meeting Industry Needs*

	Indicator	*Mean*	*Std. Deviation*	*Description*	*Interpretation*
1.	My teacher(s) often adapt their teaching approach to suit diverse learning styles.	4.625	0.484	Highly Effective	Strongly aligns with industry needs
2.	My teacher(s) are supportive in helping me understand complex electronic concepts.	4.563	0.496	Highly Effective	Strongly aligns with industry needs
3.	My teacher(s) is/are well-prepared to implement innovative teaching methods.	4.563	0.496	Highly Effective	Strongly aligns with industry needs
4.	My teacher(s) gave me sufficient freedom to choose learning methods (e.g., hands-on, and theoretical).	4.500	0.500	Highly Effective	Strongly aligns with industry needs
5.	I am confident in my teacher(s)' ability to address the challenges of innovation-based instruction.	4.500	0.500	Highly Effective	Strongly aligns with industry needs
6.	My teacher(s) effectively balance traditional and innovative methods in electronics education.	4.438	0.496	Effective	Meets most industry expectations
7.	My teacher(s) is/are satisfied with the resources available for hands-on activities and innovative learning	4.375	0.484	Effective	Meets most industry expectations
8.	My teacher(s) frequently use new teaching methods to engage students.	4.313	0.464	Effective	Meets most industry expectations
9.	My teacher(s) effectively use technology in teaching.	4.313	0.464	Effective	Meets most industry expectations
10.	I feel comfortable asking my teacher(s) for help when learning new concepts.	4.313	0.464	Effective	Meets most industry expectations
		4.450	0.485	Effective	Meets most industry expectations

The table displays that the extra teaching method used in electronics classes is thought to meet the needs of the business, with a mean score of 4.450 (Effective). Teachers' ability to adapt to different learning styles (M = 4.625) and help students understand challenging electronic ideas (M = 4.563) are two of the most highly rated indicators that show teachers' responsiveness to industry-aligned education. The approach also fits with what employers expect today, as shown by the use of new teaching methods and the integration of technology (M = 4.313–4.500).

This result fits what Mulder (2016) said about how important competency-based education is for preparing students for workplace demands. Celeste and Osias (2024) also say that strong relationships with businesses and relevant curriculum changes help students prepare for careers. Ikwumelu et al. (2015) also say that industry-aligned skills are best learned through practical, hands-on teaching. Qoshirotutthorfi et al. (2024) say that constant changes to the curriculum are necessary to keep up with changing technical needs.

Even though the teaching method was well received, some areas could be improved. For example, the use of technology in the classroom (M = 4.313) and students' willingness to ask for help with new ideas (M = 4.313) are two examples. Even though the method works, teachers may still find it hard to fully incorporate modern teaching tools and provide individualized support for each student.

The results show that the extra way of teaching works well to meet the industry's needs, giving students the skills they need to get jobs in the electronics industry. However, to make students even more ready for the job market, schools should consider spending money on new teaching tools, giving teachers ongoing training, and encouraging better partnerships between schools and businesses. This will help fill in any skills gaps that may still exist and ensure that grads are fully ready for the needs of the modern electronics industry.

Conclusions

The results of the study demonstrate that the intervention had a significant and positive impact on students' skills, as evidenced by substantial improvements across various measured indicators. Innovation-based instruction (IBI) notably enhanced the technical proficiency of electronics technology students, with competency levels progressing from moderate in the pre-test phase to high in the post-test assessments. Moreover, student motivation and engagement markedly increased, shifting from a partially innovative learning environment to one that was more dynamic, interactive, and aligned with real-world applications. The integration of IBI and the competency-based curriculum (CBC) also led to heightened career readiness, as students acquired skills that were consistent with current industry standards. Teachers played a pivotal role in implementing these instructional changes, although they faced challenges such as limited access to updated resources and difficulties with technology integration. The effectiveness of the intervention was statistically validated through the Wilcoxon Signed-Rank Test, which confirmed a significant improvement in student performance. To sustain and expand the benefits of innovation-based learning, educational institutions are encouraged to optimize instructional strategies by incorporating more hands-on training, real-world applications, and emerging technologies. Investments in modern learning tools, such as digital resources, simulation software, and electronic lab equipment, are also essential. Continuous faculty development through regular training programs on new methodologies and technology integration should be prioritized. Additionally, strengthening partnerships with industry stakeholders can ensure that instructional approaches remain relevant and career-focused. Addressing resource limitations through external funding and collaborative efforts is vital for supporting instructional effectiveness. Finally, further research should explore the long-term outcomes of innovation-based instruction on students' career readiness, employment opportunities, and certification performance to reinforce its impact and inform future practices.

References

Abu-Rub, H., Holtz, J., Rodriguez, J., & Baoming, G. (2010). Medium-voltage multilevel converters—State of the art, challenges, and requirements in industrial applications. IEEE Transactions on Industrial Electronics, 57(8), 2581-2596.

Açıkgöz, T., & Babadoğan, M. C. (2021). COMPETENCY-BASED EDUCATION: THEORY AND PRACTICE. In Ankara University, Psycho-Educational Research Reviews (Vols. 10–10, Issue 3, pp. 67–69) [Journal-article]. https://doi.org/10.52963/PERR_Biruni_V10.N3.06

Ahmid, S. S., Chun, T. C., & Abdullah, M. N. L. Y. (2023). The influence of innovative characteristics, work readiness, and vocational self-concept on employability of vocational college students. ECONSTOR. Retrieved October 31, 2024, from www.econstor.eu.

Ahmadi, N., & Besançon, M. (2017). Creativity as a stepping stone towards developing other competencies in classrooms. Education Research International, 2017(1).

Agarwal, N. (2018). A study of innovations in instructional strategies and designs for quality enrichment in higher education. Cosmos: An International Journal of Art and Higher Education.

Al Khatib, A. A. A. J., & Shaban, M. S. (2023). Innovative Instruction of Law Teaching and Learning: Using Visual Art, Creative Methods, and Technology to Improve Learning. International Journal of Membrane Science and Technology, 10(2), 361-371.

Al Rasyid, M., & Khoirunnisa, F. (2011). The effect of project-based learning on collaboration skills of high school students. Jurnal Pendidikan Sains (Jps), 9(1), 113-119.

Ariza, J. Á., & Olatunde-Aiyedun, T. G. (2023). Bringing Project-Based Learning into Renewable and Sustainable Energy Education: A Case Study on the Development of the Electric Vehicle EOLO. Sustainability, 15(13), 10275.

Asghar, M., Afzaal, M., Iqbal, J., & Sadia, H. (2022). Analyzing an appropriate blend of face-to-face, offline and online learning approaches for the in-service vocational teacher's training program. International Journal of Environmental Research and Public Health, 19(17), 10668.

ASIAN DEVELOPMENT BANK. (2021). Technical and vocational education and training in the Philippines in the age of industry 4.0. Asian Development Bank. https://creativecommons.org/licenses/by/3.0/igo/

Azis, M., & Surono, S. (2024). Integration Model Of Occupational Certification Scheme Into Instructional Design To Close The Gap Of Learning Outcomes And Industry Needs. Journal Transnational Universal Studies, 3(6), 285-300.

Balalle, H. (2024). Exploring student engagement in technology-based education in relation to gamification, online/distance learning, and other factors: A systematic literature review. Social Sciences & Humanities Open, 9, 100870. https://doi.org/10.1016/j.ssaho.2024.100870

Bates, A. W., & Sangra, A. (2011). Managing technology in higher education: Strategies for Transforming Teaching and Learning. John Wiley & Sons.

Bauer, P., & Kolar, J. W. (2015). Teaching power electronics in the 21st century. European Power Electronics and Drives. Taylor & Francis Group.

Budharani, K., D'Amico, M., & Espiritu, J. L. (2018). Developing a skilled workforce through technical and vocational education in the Philippines. ResearchGate. Retrieved October 31, 2024, from www.researchgate.net.

Clayton, R., & Harris, R. (2021). The value of vocational education and training. The International Journal of Training Research.

Calderon, J. (2021). The Impact of a Balanced Delivery Model on Graduate Outcomes: Integrating Blended Competency-Based Curriculum and Inquiry-Based Instruction. Journal of Educational Innovation and Practice, 12(3), 45-67.

Celeste, R. J., & Osias, N. (2024). Challenges and Implementation of Technology Integration: Basis for enhanced instructional program.

American Journal of Arts and Human Science, 3(2), 106–130. https://doi.org/10.54536/ajahs.v3i2.2656

Chernikova, O., Heitzmann, N., Stadler, M., Holzberger, D., Seidel, T., & Fischer, F. (2020a). Simulation-Based Learning in Higher Education: A Meta-Analysis.

Chukwuedo, S. O., & Omofonmwan, G. O. (2013). Information and communication technology: The pivot of teaching and learning of skills in electrical and electronics technology programme in Nigeria. International Journal of Vocational and Technical Education, 5(6), 117-123.

Crisol Moya, E., & Caurcel Cara, M. J. (2021). Active methodologies in physical education: Perception and opinion of students on the pedagogical model used by their teachers. International journal of environmental research and public health, 18(4), 1438.

Department of Education (DepEd). (2022). Integrating inquiry-based instruction with competency-based curriculum: Policy directions and implementation strategies. Manila: DepEd Publications.

Dikmen, C., & Demirer, V. (2022). The role of technological pedagogical content knowledge and social cognitive variables in teachers' technology integration behaviors. Participatory Educational Research, 9(2), 398-415.

Doherty-Restrepo, J. L., Perez, K., Creeden, M., Cram, B., & Charite, M. (2023). Closing the Gap Between Students' Career Readiness and Employers' Expectations: An Innovative Competency-Based Approach. International Journal of Innovative Teaching and Learning in Higher Education (IJITLHE), 4(1), 1-14.

Dumaua-Cabauatan, M., et al. (2018). Education in the Philippines: The case of technical education and skills development authority online program. ECONSTOR. Retrieved October 31, 2024, from www.econstor.eu.

Duprey, M. D., & Dunker, K. S. (2021). Megacode simulation training in undergraduate nursing education. Nursing Education Perspectives, 42(3), 193-194.

Duterte, J. P. (2024). Technology-Enhanced Learning Environments: Improving engagement and learning. International Journal of Research and Innovation in Social Science, VIII(X), 1305–1314. https://doi.org/10.47772/ijriss.2024.8100111

Eremeeva, G. R., Martynova, E. V., & Zalyalova, E. F. (2020, May). Digitalization in education: case studies on the implementation of students' developments in the educational process. In International Scientific Conference "Digitalization of Education: History, Trends and Prospects"(DETP 2020) (pp. 335-341). Atlantis Press.

Febriyana, N., Indrawati, H., & Makhdalena, M. (2023). The influence of emotional intelligence, industrial work practices, soft skills, and self-efficacy on students work readiness. Journal of Educational Sciences, 7(3), 499-517.

Forte-Celaya, J., Ibarra, L., & Morales, L. (2021). Analysis of creative thinking skills development under active learning strategies. Education Sciences, 11(10), 621.

Guadalupe, J. T., T., Abaya, E. C., C., & Camposano, C. C., C. (2023). Enacting music Curriculum contextualization in the Philippine K to 12 curriculum: Negotiations, constraints, and mediating forces. In Philippine Journal of Education Studies, Philippine Journal of Education Studies (Vol. 1, Issue 1) [Journal-article].

Hahn, C. J., & Gangeness, J. E. (2019). Business, Leadership And Education: A Case For More Business Engagement In Higher Education. American Journal of Business Education, 12(1), 19-31.

Hmelo-Silver, C., et al. (2013). The International Handbook of Collaborative Learning. Taylor & Francis Group.

Henderson, M., Selwyn, N., & Aston, R. (2015). What works and why? Student perceptions of 'useful' digital technology in university teaching and learning. Studies in Higher Education, 42(8), 1567–1579. https://doi.org/10.1080/03075079.2015.1007946

Hoq, M. Z. (2019). Blended Learning: A New Approach to Teaching and Learning. International Journal of Education and Learning, 1(2), 45-56.

Ikwumelu, S. N., Oyibe, O. A., Oketa, E. C., & Department of Arts and Social Science Education, Ebonyi State University, P. M. B. 053, Abakaliki Nigeria. (2015). Adaptive teaching: an invaluable pedagogic practice in social studies education. In Journal of Education and Practice: Vol. Vol.6 (Issue No.33, pp. 140–141). https://files.eric.ed.gov/fulltext/EJ1083517.pdf

Ismail, S. N., Don, Y., Husin, F., & Khalid, R. (2018). Instructional Leadership and Teachers' Functional Competency across the 21st Century Learning. International Journal of Instruction, 11(3), 135-152.

Jiang, H., Yang, Y., & Song, G. (2016). A theory of creative expressiveness: Empirical studies in Chinese universities. Chinese Management Studies, 10(2), 387-404.

Kanyonga, L., Mtana, N., & Wendt, H. (2019). Implementation of competency-based curriculum in technical colleges: The case of Arusha City, Tanzania.

Khoerunnisa, I., Wahyudin, D., Handayani, S., & Ana, A. (2020). Should vocational schools be strategically located with relevant industries to reduce graduates' competency gaps? Atlantis Press. Retrieved October 31, 2024, from www.atlantis-press.com.

Kiong, J. F. (2023). The Impact of technology on Education: A case study of schools. Journal of Education Review Provision, 2(2), 43–47. https://doi.org/10.55885/jerp.v2i2.153

Kurniawati, F. N., Susanto, S., & Munir, A. (2019). PROMOTING STUDENTS'COLLABORATION SKILL THROUGH PROJECT BASED LEARNING OF ENGLISH WRITING. ANGLO-SAXON: Jurnal Ilmiah Program Studi Pendidikan Bahasa Inggris, 10(1), 29.

Liao, Y., Zhang, Y., & Huang, R. (2023). Institutional support and teacher preparedness in blended learning environments: A systematic review. Journal of Educational Technology & Society, 26(1), 45-60.

Lin, M., Chen, H., & Liu, K. (2017). A study of the effects of digital learning on learning motivation and learning outcome. Eurasia Journal of Mathematics Science and Technology Education, 13(7), 3553–3564. https://doi.org/10.12973/eurasia.2017.00744a

Masoud, M. (2023). Road map of power electronics knowledge and skills for enhancing engineering graduates' employability.

Mayorga, L. K. (2019). HEIs and workforce development: Helping undergraduates acquire career-readiness attributes. Industry and Higher Education, 33(6), 370-380.

Miller, J. (2021). The impact of competency-based education on technical skills and creative thinking in graduates. Journal of Educational Research, 114(2), 123-135.

Mudannayake, M. A. D. A. L., & Weerasinghe, T. A. (2017). ICT for psychosocial competence development among adolescents. In Proceedings of the International Conference on Global Education and E–Learning (Vol. 1, pp. 9-18).

Mulder, M. (2016). Competence-based vocational and professional education. In Technical and vocational education and training. https://doi.org/10.1007/978-3-319-41713-4

Mustikawanto, A., Abdullah, A. G., & Hasan, B. (2019, December). Effect of competency, work motivation, industrial work experience and facilities on the readiness of work for senior high school graduates in electro expertise programs. In International Conference on Education, Science and Technology (pp. 433-437). Redwhite Press.

Naomi, C., Kaptingei, S., & Rotumoi, J. (2023). Influence of teachers' preparedness on implementation of competency-based curriculum (CBC) in public primary schools in Bomet East Sub-county, Kenya. International Journal of Research and Innovation in Social Science, 7(1).

Nassiuma, B. K., Mauyo, L. W., & Beru, M. M. (2021). Codified knowledge, knowledge resources, design, application and implications on effectiveness in institutions of higher education in Kenya. African Journal of Business Management, 15(1), 49-58.

Noviyanto, A. T., & Wijanarka, B. S. (2023). Influence of emotional intelligence, digital literacy, and student self-efficacy on job readiness of the mechanical engineering skills program at vocational schools in Yogyakarta City. IJSSHR. Retrieved October 31, 2024, from ijsshr.in.

Nugroho, A., & Haghegh, M. (2021). Emergency remote teaching amidst global pandemic: Voices of Indonesian EFL teachers. Veles Voice of English Language Education Society, 5(1), 66-80.

Ovbiagbonhia, A. R., Kollöffel, B., & Brok, P. D. (2023). Investigating the impact of innovation competence instruction in higher engineering education. European Journal of Engineering Education, 48(6), 1068-1101.

Putri, Z. R., Nurwahidin, M., & Mayasari, S. (2023). Analysis of work readiness personality attributes students of class XI SMK Negeri 8 Bandar Lampung school year 2022/2023 after COVID-19 pandemic. JETISH. Retrieved October 31, 2024, from jetish.com.

Qoshirotutthorfi, T., Nasrudin, H., & Azizah, U. (2024). Development of Problem-Solving-Oriented Electronic Module (E-Module) to improve the critical thinking skills of Class XI senior high school students on Acid-Base material. International Journal of Current Science Research and Review, 07(06). https://doi.org/10.47191/ijcsrr/v7-i6-79

Ramos, L. (2022). Challenges in implementing innovative learning models in technical education: A study on funding constraints and policy needs. Philippine Journal of Educational Research, 15(1), 67-82.

Red'ko, V., Sorokina, N., Smovzhenko, L., Onats, O., & Chyzhevski, B. (2023). Situational foreign language instruction in competency-based learning framework: Ukrainian experience. International Journal of Learning, Teaching and Educational Research, 22(5), 637-657.

Retnawati, H., Djidu, H., Kartianom, K., Apino, E., & Anazifa, R. (2018). Teachers' knowledge about higher-order thinking skills and its learning strategy. Problems of Education in the 21st Century, 76(2), 215-230.

Ritter, S., Gu, X., Crijns, M., & Biekens, P. (2020). Fostering students' creative thinking skills by means of a one-year creativity training program. PLOS One, 15(3), e0229773.

Rochmayanti, F., Kuat, T., & Tentama, F. (2022). Effect of internship performance and work motivation on vocational students' work readiness. IJEI. Retrieved October 31, 2024, from www.ijei.com.

Saeed, B., & Ramdane, T. (2022). The effect of implementing a creative thinking model on the development of creative thinking skills in high school students: A systematic review. Review of Education, 10(3).

Singelmann, L., & Ewert, D. (2022). Leveraging the innovation-based learning framework to predict and understand student success in innovation. IEEE Explore. Retrieved October 31, 2024, from ieeexplore.ieee.org.

Shodipe, T. O., & Ohanu, I. B. (2020). Electrical/electronics technology education teachers attitude, engagement, and disposition towards actual usage of Mobile learning in higher institutions. Education and Information Technologies, 26(1), 1023–1042. https://doi.org/10.1007/s10639-020-10297-y

Sin, N. D. M., & Hussin, M. Z. (2024). OUTCOME BASE EDUCATION IMPLEMENTATION EDUCATION IN TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING: a CHALLENGE AND ISSUE. International Journal of Modern Education, 6(22), 389–408. https://doi.org/10.35631/ijmoe.622028

Singelmann, L., et al. (2021). Creation of a framework that integrates technical innovation and learning in engineering.

Spöttl, G., & Windelband, L. (2020). The 4th industrial revolution – its impact on vocational skills. Tandfonline. Retrieved October 31, 2024, from www.tandfonline.com.

Su, Y., Shao, M., & Zhao, L. (2021). Effect of mind mapping on creative thinking of children in Scratch visual programming education. Journal of Educational Computing Research, 60(4), 906-929.

Sulistiobudi, R. A., & Kadiyono, A. L. (2023). Employability of students in vocational secondary school: Role of psychological capital and student engagement. CE. Retrieved October 31, 2024, from ce.com.

Suuryanto, H., Degeng, I. N. S., Djatmika, E. T., & Kuswandi, D. (2021). The effect of creative problem solving with the intervention of social skills on the performance of creative tasks. CS. Retrieved October 31, 2024, from cs.com.

Tell, J., & Hoveskog, M. (2022). Applied engineering education for soft skills in the context of sustainability and mobility. International Journal of Sustainability in Higher Education, 23(8), 324-336.

Tentama, F., Rahmawati, P. A., & Muhopilah, P. (2019). The effect and implications of work stress and workload on job satisfaction. International Journal of Scientific and Technology Research, 8(11), 2498-2502.

Thipatdee, G. (2020). The development of English competency-based curriculum integrated with local community for high school students. Journal of Education and Learning, 10(1), 39.

Torres, J. (2021). Evaluating student outcomes in electronics technology programs: The role of project-based learning and competency-based curriculum. International Journal of Vocational Education and Training Research, 8(2), 115-130.

Vani, M. M., Baig, Y. M., Wesley, C., & Iqbal, S. R. (2021). Sustainable project-based learning: A more practical approach. Journal of Engineering Education Transformations, 34(0), 718.

Vergonia, B., & Mombas, S. (2022). Ready to go? Profiling Philippines high school teachers' readiness for blended learning in post-COVID-19 era. Journal of Educational Management and Instruction (JEMIN, 2(1), 12-23.

Xia, T., Sun, Y., An, Y., & Li, L. (2023). The influence of music environment on conceptual design creativity. Frontiers in Psychology, 14.

Yang, Z., Barnard-Brak, L., & Siwatu, K. (2018). How does the availability of information and communication technology (ICT) resources mediate the relationship between socioeconomic status and achievement? Journal of Technology in Behavioral Science, 4(3), 262–266. https://doi.org/10.1007/s41347-018-0079-x

Yusof, Y., Bako, I., Roddin, R., Mukhtar, M., & Hamid, H. (2023). Competencies needed for improving teaching among lecturers of polytechnics in north-western Nigeria. Journal of Technical Education and Training, 15(1).

Affiliations and Corresponding Information

Dexter Louis P. Gialogo
Sultan Kudarat State University – Philippines