INDIAN JOURNAL OF SCIENCE AND TECHNOLOGY

RESEARCH ARTICLE

Navigating Remote Learning: A Student and Faculty Perspective on Skills Development in Technology Courses

Rowena P Capada[1]*

1 Eastern Samar State University, Borongan, Eastern Samar, Philippines

OPEN ACCESS

Received: 26-04-2023

Accepted: 08-08-2023

Published: 13-11-2023

Citation: Capada RP (2023) Navigating Remote Learning: A Student and Faculty Perspective on Skills Development in Technology Courses. Indian Journal of Science and Technology 16(42): 3786-3794. https://doi.org/10.17485/IJST/v16i42.977

* **Corresponding author**.

rowena.capada@essu.edu.ph

Funding: None

Competing Interests: None

Published By Indian Society for Education and Environment (iSee)

ISSN
Print: 0974-6846
Electronic: 0974-5645

Abstract

Objectives: This study aimed to evaluate the achievement of learning outcomes in four technical programs during remote learning. **Methods:** This study, conducted upon resumption of in-person classes, used a survey-based quantitative design to assess student's competence in four technology programs. The assessment involved 114 students and 16 faculty members, using a 5-point scale to determine competence levels. Statistical analyses compared and correlated perceptions, including a paired-sample t-test and Pearson correlation. Additionally, a qualitative approach gathered insights on remote learning challenges and best practices. **Findings:** The results indicate that students rate themselves higher than faculty regarding perceived competency levels in all four programs. However, the correlation between student and faculty ratings varies across programs. The study highlights the importance of continuous monitoring and improvement of the quality of education in remote learning environments. The study revealed that students' self-perceived competence levels were generally higher than faculty members' perceptions across all four technology programs: Automotive Technology, Drafting Technology, Electrical Technology, and Electronics Technology. The t-value of 5.7087 indicated a significant difference. However, a Pearson correlation coefficient 0.6011 suggested a moderately strong positive correlation between the ratings. Most students rated their competence moderately high in Drafting Technology and Automotive Technology courses, while faculty ratings varied from moderately low to moderately high. Electrical and Electronics Technology courses exhibited similar trends. These findings, unique in remote learning during the pandemic, underscore the influence of factors such as prior knowledge, resource availability, and exposure to technical drawing and relevant technologies on perceived competence levels. They also highlight the challenges posed by limited resource access, particularly in geographically isolated areas, adding valuable insights to existing reports on remote education. **Novelty:** This study uniquely juxtaposes students' self-perceived competencies with faculty perceptions across multiple technology courses, revealing critical insights for improving alignment and understanding in technology education.

Keywords: remote learning; student achievement; competency levels; technical programs; perceptions

1 Introduction

The global health crisis of 2020 severely disrupted education systems around the world, necessitating a swift pivot to remote learning to ensure educational continuity[1,2]. This sudden transition posed considerable challenges, especially for students enrolled in technology courses that demanded extensive laboratory work. The mode of remote learning significantly hindered the acquisition of practical skills essential for achieving learning outcomes[3]. In many technology courses, laboratory activities and hands-on learning form crucial components of the curriculum. Regrettably, remote education restricted students' engagement in these activities, making it challenging to acquire the necessary practical skills.

Moreover, the pandemic erected significant hurdles for some students, particularly those from low-income households and under-resourced communities. These students grappled with accessing distance learning due to insufficient technology, limited internet connectivity, geographical distance, and a lack of transportation options[4,5]. Furthermore, the anxiety and stress induced by the pandemic adversely affected students' mental health and well-being, making it difficult for them to stay engaged and motivated in remote education[6,7]. These factors created extra hurdles for students in keeping up with coursework, completing assignments, and participating in online discussions and activities. This digital divide underscored the urgency for more equitable access to technology and internet connectivity.

The pandemic-era distance learning posed an array of challenges for students who relied on face-to-face interactions and peer support for staying motivated and engaged in their studies[8]. While some students struggled to adjust to the new learning format, others felt isolated and disconnected from their peers and instructors. These challenges underlined the necessity for additional support services and resources, such as online counseling and tutoring, to help students surmount these obstacles and succeed in distance learning[9]. Therefore, addressing these issues is vital for fostering inclusive and equitable education systems, particularly in technology courses.

Throughout the remote learning period, academic institutions grappled with the need to adapt to unprecedented circumstances. Consequently, they implemented changes to regulatory norms, such as grading policies, assessment methods, attendance requirements, and administrative regulations, to enable students to continue their education effectively despite the obstacles of remote learning[10–12]. Concurrently, educators reassessed both their teaching methods and evaluation standards, prioritizing the need for students to demonstrate basic competencies. These modifications sought to provide students with necessary flexibility and support during the transition.

Nonetheless, it is crucial to acknowledge that while these changes were necessary, they might have affected the development of competencies vital for job searches and future employment. The altered academic environment might have curtailed opportunities for practical skill acquisition and hands-on experience, potentially creating a gap between academic achievements and real-world readiness. Consequently, considering the potential long-term effects of these modifications and exploring strategies to bridge the gap becomes imperative to ensure students' holistic development and equip them with the necessary skills for success beyond academia.

This study was designed to assess the impact of remote education on the skills development of students enrolled in technology courses such as automotive, drafting, electrical, and electronics at Eastern Samar State University, Philippines. Unlike previous studies that relied solely on respondents' perceptions, this study employed a more practical approach. Nearly a year after resuming in-person classes, a follow- up assessment was conducted to gauge the competencies students had acquired. This assessment was based on the student learning outcomes (SLOs) defined for each course. The responsibility of carrying out impactful assessments to ascertain student learning outcomes is a multifaceted and demanding task for teachers in higher education [13]. Faculty members, who had the opportunity to observe students directly, played a crucial role in this evaluation. The primary objective was to compare the students' self-perceptions and the faculty's observations of the students' competencies. By understanding the discrepancies between these two perspectives, the study aimed to shed light on the challenges of remote learning and assessment of student learning outcomes.

Interestingly, even after the resumption of in-person classes, many higher education institutions, including the University, continued to adopt remote education strategies [14,15]. This ongoing reliance on remote learning underscores its relevance in the current educational landscape. The insights gained from this study could inform the development of more effective remote learning strategies and assessment methods, facilitating students in fully developing and demonstrating their competencies regardless of the learning environment. These findings contribute to the continuous evolution of higher education in the era of remote learning and provide valuable insights and best practices based on the experiences encountered during this exceptional period.

2 Methodology

The study employed a survey-based methodology with a quantitative research design to assess students' competence levels. The questionnaire was crafted based on the learning outcomes of four technology programs: Automotive Technology, Drafting Technology, Electrical Technology, and Electronics Technology. The University offered these programs during the remote education period of SY 2020 – 2022. The study focused solely on the first two levels of the four programs, as the University offered these courses during the pandemic. When in-person classes resumed, faculty members conducted follow-up assessments, using their observations as the basis for their ratings.

A total of 114 students enrolled in the second and third-year levels of the program, and 16 faculty members participated in the survey. The questionnaire was structured so that second-year students responded to inquiries about first-year courses while third-year students provided feedback on second-year courses. The competence level assessment utilized a 5-point scale, ranging from 1 (very low competence) to 5 (high competence).

To determine the competence level for each course, we calculated the average weighted mean of learning outcomes based on responses from both students and faculty members. We then computed an overall mean, using higher values to represent higher competence levels within each program.

Descriptive statistics were used to analyze the overall competence level of the students. Additionally, a paired-sample t-test was conducted to compare perceptions of competence between students and faculty members. The Pearson correlation coefficient was also calculated to measure the degree of agreement between the ratings. These statistical analyses provided valuable insights into perceived competencies and potential discrepancies in perceptions between students and faculty.

In addition to the quantitative analysis, a qualitative approach was used to gather insights on technology courses' challenges and best practices during remote learning. Interviews were conducted to gather rich, in-depth data from participants. Data was analyzed based on a well-established method [16]. This process involved multiple stages, such as familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and finally, writing the report. Thematic analysis allowed for identifying meaningful themes and patterns that shed light on the experiences and perspectives of students and faculty during the remote education period.

Throughout the study, ethical considerations were strictly adhered to, ensuring voluntary participation, informed consent, confidentiality, and appropriate data usage for research purposes, thus safeguarding the rights and privacy of all participants. The combination of quantitative and qualitative methods in this study provided a comprehensive and robust understanding of students' competence levels and the factors influencing them in technology programs during the challenging period of remote education.

3 Results

The study results provide insights into the self-perceived competency levels of students in technology courses during remote learning. The study also examines faculty perspectives on students' competency levels and explores the factors that may influence the students' perceptions of their competencies. The findings have significant implications for students and faculty in navigating remote learning and developing skills in technology courses.

3.1 Students' Competency Levels in Automotive Technology Courses: Perceptions by Both Students and Faculty

In the Automotive Technology courses, students' self-perceived competence levels varied from average (3.0 to 3.39) to moderately high (3.42 to 3.91). Among the 33 courses, 16 (48%) were rated as average, while 17 (52%) were considered moderately high. These results suggest that students believe they have acquired the necessary skills and knowledge in their courses, with the majority falling into the moderately high category.

On the other hand, faculty members perceived students' competence levels across a range from moderately low (2.33) to moderately high (3.67 to 4.00). Only one course (3%) was found to have low competence, while 16 (48%) were rated as average and another 16 (48%) as moderately high. These results indicate that overall, students have acquired substantial knowledge, experience, and the ability to perform tasks accurately and skillfully in these areas.

Of particular interest, the study found no significant difference between the mean competency levels perceived by students and faculty in the Automotive Technology courses, as indicated by the results of the paired t-test. This finding suggests a consensus between students and faculty regarding the students' competency levels. Additionally, the Pearson correlation coefficient of 0.4607 indicates a moderate positive correlation between the two sets of ratings, suggesting agreement in their perceptions of competency levels.

These findings offer critical insights into evaluating competence in automotive technology courses. They can serve as a valuable guide for curriculum improvements and adjustments in teaching methodologies, helping to identify areas where course competency may require improvement or supplementation.

The self-perceived competency levels of students and faculty in the Automotive Technology courses aligns with previous research findings. Research consistently indicates that students' self-perceived competency levels significantly impact their motivation, engagement, and academic performance. In this case, the finding that students perceive themselves as having acquired the necessary skills and knowledge in the Automotive Technology courses suggests a positive perception of their competence. This positive perception may contribute to their motivation and drive to excel in the subject matter.

Furthermore, the results support the importance of resource-based learning (RBL) in the automotive technology program. RBL has demonstrated that when students are provided with diverse and high-quality resources, they engage in active learning, develop a deeper understanding of the subject matter, and apply their knowledge in practical contexts[17]. The emphasis on independent, student-driven learning and active engagement with diverse resources aligns with the findings of students' self-perceived competency levels. It suggests that students who took charge of their learning and made use of available resources were able to enhance their automotive technology competencies. This result aligns with the principles of RBL, where students' active role in the learning process is emphasized.

Moreover, the importance of external factors, such as facilities and access to resources, has been highlighted in many studies. Adequate resources, including equipment, materials, and supportive learning environments, positively influence students' competence development and educational experiences. Although the analysis does not specifically address the impact of facilities, it suggests that students could develop their competence even with limited resources during the pandemic. This may indicate that students had access to necessary resources and equipment or could acquire the required knowledge and skills through alternative means, such as proximity to motor shops and engaging in hands-on activities using readily available materials.

In conclusion, the self-perceived competency levels and the influence of resource-based learning in the Automotive Technology courses align with previous research findings. Students' positive perception of their competence, coupled with the principles of resource-based learning, indicates their motivation, active engagement, and ability to develop necessary skills. This also highlights the importance of resource access and supportive learning environments in promoting students' competence development.

3.2 Students' Competency Levels in Drafting Technology Courses: Perceptions by Both Students and Faculty

Drafting Technology courses aim to develop drafting skills and knowledge, including technical drawing, computer-aided drafting, architectural drafting, and machine drafting.

Students' self-perceived competence levels in Drafting Technology courses indicate that most courses (68%) were rated as moderately high, meaning they have substantial knowledge, experience, and a degree of skill and accuracy in performing tasks related to the coursework. In comparison, 32% of courses were rated as average. Faculty members' perception of students' competence ranged from moderately low to moderately high. Out of 40 courses, 6 (3%) were rated as moderately low, 17 (42.5%) as average, and 17 (42.5%) as moderately high. This result suggests a discrepancy between students and faculty regarding the perception of students' competency levels, with students rating their competence higher than the faculty. Such gaps in self-assessment and faculty evaluation can help guide curriculum improvements and instructional strategies to enhance student learning outcomes.

A paired t-test was conducted to compare the mean competency levels of students and faculty in Drafting Technology courses, revealing a significant difference, $t(39) = 5.7087$, $p < 0.05$. Students rated their competency levels significantly higher than faculty members, with a mean competency level of 3.4368 for students and 3.1375 for faculty. The Pearson correlation coefficient of 0.6011 suggested a moderately strong positive correlation between the two sets of ratings, indicating some agreement between students and faculty regarding the perception of competency levels.

Relevant literature have highlighted the significance of self-perceived competency levels in students' motivation, engagement, and academic achievement. Students' beliefs about competence can impact their willingness to take on challenges, persist in the face of setbacks, and actively engage in learning activities. Studies have shown that students rate their competence levels higher than their teachers or instructors. This difference can arise due to factors such as students' self-enhancement biases, social comparison processes, and expectations and standards between students and faculty.

The results also highlight the influence of prior knowledge and exposure to resources on students' self-perceived competency levels. Studies have shown that prior knowledge and hands-on experience can positively impact students' confidence and perceived competence. Access to resources, such as technology tools, software, and materials, has also significantly influenced students' perception of their abilities and achievement. Studies have shown that equitable access to resources and opportunities for practice and exploration contribute to higher self-perceived competency levels among students.

Integrating technology-based learning approaches, aligns with research findings on effective instructional strategies in technology education. Studies have demonstrated the benefits of technology integration in improving student engagement, collaboration, and achievement, such as online courses, blended learning, and mobile learning[18]. Providing access to technological resources, promoting interactive and student-centered learning experiences, and incorporating feedback mechanisms have been identified as effective practices in technology-based learning environments[8,17].

3.3 Students' Competency Levels in Electrical Technology Courses: Perceptions by Both Students and Faculty

The Electrical Technology courses encompass various topics related to electrical systems, including circuit design, electronics, electrical wiring, and safety.

According to the distribution of self-perceived competence levels reported by students in these courses, students generally rated themselves moderately high in competence in most learning outcomes. In contrast, faculty members perceived students' competence levels as relatively lower. Specifically, students' self-perceived competence levels ranged from average (2.94 to 3.38) to moderately high (3.41 to 3.84), with 37% of courses rated average and 63% rated moderately high. On the other hand, faculty members' perceived competence levels ranged from low (1.33 to 1.67), moderately low (2.00 to 3.30), and average (2.67 to 3.00), with 37% of courses rated as low, 55% rated as moderately low, and 8% rated as average. This discrepancy might suggest an overestimation of skills by the students or highlight areas where further instruction is needed.

The paired t-test results indicated a significant difference between the mean competency levels of students and faculty in Electrical Technology courses ($t(37) = 20.6366$, $p < 0.05$). Students rated their competency levels significantly higher (mean = 3.4202) than faculty members (mean = 1.9298). The weak positive correlation (Pearson correlation coefficient = 0.1247) suggested limited agreement between students and faculty members regarding the perception of students' competency levels.

Several factors influence students' self-perception of their competency levels in the electrical technology program. Prior experience and exposure to the technology facilitated their ability to understand and apply complex electrical concepts and principles. The availability of equipment and facilities for hands-on learning and support from instructors and peers are also significant factors influencing students' self-perceived competence levels in Electrical Technology courses. Furthermore, in some areas where students live, every Barangay has a Barangay Electrician to mentor students, providing them with additional resources for hands-on learning. However, the issue of some parents and other family members considering using electricity as a risk may limit students' exposure to the field. It is essential to address such concerns and provide proper education on electrical safety to parents and family members to ensure that students have access to the necessary resources and support for their learning.

These findings imply the importance of incorporating experiential learning approaches in the program. Experiential learning provides opportunities for students to apply theoretical concepts to real-life situations, allowing for a deeper understanding and retention of knowledge gained[19]. Given the complexity of the subject matter, quality instruction, and hands-on learning opportunities are necessary to build students' confidence and understanding of electrical technology. Collaborative and peer-to-peer learning approaches can also support students' learning and foster a supportive learning environment[16].

Overall, the findings suggest incorporating experiential learning and collaborative approaches can enhance students' learning outcomes in Electrical Technology courses. These approaches can promote a deeper understanding and retention of theoretical concepts while providing opportunities for practical application and collaboration with peers and instructors.

3.4 Students' Competency Levels in Electronics Technology Courses: Perceptions by Both Students and Faculty

In Electronics Technology courses, students' self-perceived competence levels range from low (2.14 to 2.57), average (2.71 to 3.43), to moderately high (3.00 to 3.71). Out of 13 courses, 38% (5 courses) have low competence levels, 23% (3 courses) have moderately high competence levels, and the remaining 38% (5 courses) have an average level of competence.

Faculty's perceived competence levels in Electronics Technology courses range from low (2.00 to 2.50), average (2.00 to 3.00), to moderately high (2.00 to 3.00). The percentage of courses with low competence levels is 62% (8 out of 13), while 15% (2 out of 13) are rated as moderately high competence, and the remaining 23% (3 out of 13) are rated as average competence.

The paired t-test results indicate a significant difference between the mean competence levels of students (mean = 2.857) and faculty (mean = 2.324), with a t-value of 6.975 and a p-value of 3.53377E-08, highlighting a significant discrepancy in their perception of students' competence levels. The positive Pearson correlation coefficient of 0.34 suggests some agreement between the two groups, albeit with potential discrepancies.

The self-perceived competency levels of students in Electronics Technology courses can be affected by various factors. For example, students with prior experience in electronics and computer programming may have an advantage in understanding and applying complex electronic concepts and principles. However, limitations such as the availability of equipment and facilities for hands-on learning, access to the internet, gadgets for online learning, and communication with teachers and peers have been identified as significant challenges [18]. It is worth noting that the challenges faced in Electronics Technology courses, such as the limited availability of equipment and resources, poor internet connection, and lack of access to technology, are common to this program. The three other technology courses face similar challenges that impact the self-perceived competency levels of students.

Moreover, the lack of solid family support can also hinder students' learning, as some come from families who need more expertise to mentor them. The community also needs more resources, with some areas having no electronics shops, unlike in Electrical Technology, where every Barangay has a Barangay Electrician to mentor the students. Furthermore, some students have been working during this period, which may have diminished their interest in continuing their studies.

These challenges highlight the need for instructors to consider the availability or scarcity of resources when designing and implementing teaching strategies. They may need to adjust their teaching methods to accommodate the available resources or find alternative ways to provide access to the lacking resources. Students should proactively seek resources or work with instructors to find innovative solutions to overcome resource limitations [9,17]. Thus, resource availability can affect learning approaches, and adaptation and flexibility in teaching and learning strategies may be necessary.

3.5 Comparative Analysis of Students' Competency Levels: Perceptions by Both Students and Faculty

In the overall analysis of the comparison of students' self-perceived competence and faculty's perception of students' competence across five competence levels: Low, Moderately Low, Average, Moderately High, and High. The following are the key insights:

3.5.1 Low and High Competence Levels

There is a consensus between students and faculty that no students fall into these extremes of competence. This suggests that students are generally not perceived to be at very low or high levels of competence.

3.5.2 Moderately Low Competence Level

A discrepancy is observed here. While students perceive no peers in this category, faculty perceive some students to be at a moderately low competence level. This suggests that faculty may have identified a group of students who they believe could be performing better, which the students themselves may need to recognize.

3.5.3 Average and Moderately High Competence Levels

Students perceive more peers to be at these competence levels than faculty do. This indicates that students generally feel confident in their abilities, but faculty may have a more stringent assessment of student competence.

Overall, the analysis suggests a general alignment in the perception of student competence, with some notable discrepancies. These discrepancies could be due to differences in expectations or understanding of competence between students and faculty. This could be an area for further investigation and discussion to ensure alignment in expectations and understanding of competence levels. The findings could inform program improvements, student support services, and faculty training.

3.6 Thematic Analysis of Best Practices and Challenges

3.6.1 Emphasizing Resource-Based Learning and Technology-Based Learning

The significance of leveraging available resources in Automotive, Drafting, Electrical, and Electronics Technology is in harmony with the broader themes discussed in the cited literature. The detailed review on technology-based learning in interdisciplinary STEM education underlines the importance of hands-on experience in Automotive Technology using local motor shops and tools [20]. This also finds relevance in Drafting Technology, where the need for laptops and internet connectivity corresponds with the emphasis on modern devices in STEM. Similarly, Electrical Technology's requirement for equipment and hands-on learning, and Electronics Technology's challenges due to limited resources, underscore the focus on the essential role of technology [21]. Concurrently, insights into how technology enhances communities of practice can be related to these findings [20]. While they directly support Drafting Technology's emphasis on laptops and internet connectivity, these insights also parallel the enhancement of community learning in Automotive Technology and the necessity of technological resources in Electrical and Electronics Technology. Together, these connections reinforce the argument that leveraging technological and physical resources is fundamental to effective learning and collaboration, particularly within education's technical and vocational fields.

3.6.2 Adapting Teaching Approaches

Teachers' recognition of the need to adapt their teaching approaches to the challenges of remote learning in Automotive, Drafting, and Electronics Technology resonates with contemporary educational literature. Automotive Technology's adjusted expectations and grading criteria to prioritize minimum learning competencies align with the insights into adult learning theories and the importance of contextualizing learning [22]. Drafting Technology's emphasis on technology-based learning connects to the study on emergency remote teaching during the COVID-19 pandemic, highlighting the global push for adaptation in teaching through technological means [23]. Electronics Technology's focus on flexibility and adaptation echoes both studies, underscoring the broader educational trend towards adaptability, technological readiness, and tailored approaches to meet individual and situational learning needs [22,23]. These connections reinforce the significance of innovation and responsiveness in education, particularly in fields that require a hands-on and technology-integrated approach.

3.6.3 Experiential Learning and Mentorship

The emphasis on experiential learning and mentorship in Automotive and Electrical Technology aligns well with contemporary research findings. In Automotive Technology, encouraging students to visit automotive shops for observation and apprenticeships resonates with the paper on experiential learning that emphasizes the importance of hands-on experience in motivating and engaging students [24]. This direct exposure to the field enables a deeper understanding of concepts and fosters a tangible connection to the industry. Similarly, in Electrical Technology, the emphasis on prior experience and support from instructors and peers, as well as the presence of Barangay Electricians, highlights the significance of mentorship and hands-on learning. This aligns with the research report that illustrates the positive impact of effective mentoring training, education, and development on enhancing students' competence [25]. By linking practical experience with supportive mentorship, these programs underscore a broader educational trend that recognizes the interplay between experiential learning and mentorship in fostering competence, confidence, and real-world readiness.

3.6.4 Challenges in Remote Learning

The recognition of challenges posed by remote learning in the programs, including limited access to resources, poor internet connectivity, and geographical isolation, is well-represented in recent academic literature. Exploring parents' experiences during emergency remote teaching sheds light on the personal and family challenges encountered during this educational shift, resonating with the identified barriers to learning [26]. The research into the obstacles faced during the COVID-19 pandemic in higher education further underscores the multifaceted difficulties in transitioning to online and remote learning, such as those faced by students and faculty in the programs [27]. Meanwhile, the works reflecting on postdigital obstacles in redefining education and measuring excellence lend a broader perspective to these challenges [28]. These works collectively frame the local difficulties identified in the programs within a wider global context, affirming the significant impact of remote learning's barriers on students' self-perceived competency levels and faculty perceptions of students' competency levels. They also highlight the ongoing discourse and research aimed at understanding and overcoming these obstacles.

3.6.5 Support and Collaboration

The study's emphasis on the importance of support and collaboration in Drafting and Electrical Technology aligns with insights from recent research. The systematic literature review focusing on retention strategies emphasizing support and collaboration mirrors the faculty members' recognition of peer-to-peer and collaborative learning approaches as crucial for promoting students' achievement of learning outcomes [(29)]. This collaboration fosters a supportive learning environment and enhances retention through active engagement. Similarly, the critical review on mobile learning integration highlights the role of technology in fostering a collaborative environment [(30)]. This technological approach to collaboration may resonate particularly with Drafting Technology, where technology-based learning approaches are prevalent. This literature affirms the practical importance of partnership and support in modern educational practices, emphasizing a blend of traditional peer-to-peer interactions and innovative technological methods to facilitate learning.

4 Conclusion

This study provides a comprehensive and novel analysis of the perceived competency levels of students and faculty in various technology courses. The findings reveal both alignments and discrepancies in these perceptions, offering valuable insights for enhancing teaching and learning outcomes in technology education.

In Automotive Technology courses, there was a consensus between students and faculty regarding competency levels, suggesting effective teaching-learning processes. However, in Drafting Technology and Electrical Technology courses, students generally rated their competence higher than faculty members, indicating a need for improved communication and alignment of expectations. In Electronics Technology courses, students and faculty perceived relatively low levels of competence, pointing to potential areas for curriculum enhancement.

The study underscores the importance of understanding and aligning perceptions of competency levels in technology education. Educators should design interventions that enhance students' learning experiences, improve feedback mechanisms, and address psychological factors such as self-efficacy and feelings of inadequacy.

Based on these findings, the study recommends implementing pedagogical strategies that enhance competency development and align students' self-perceptions with faculty evaluations. It also suggests developing effective feedback mechanisms and incorporating psychological support in the curriculum. Educators should regularly review and update the curriculum to ensure it meets the industry's and students' evolving needs.

The study also identifies several avenues for future research. These include exploring the reasons behind the discrepancies in perceptions, investigating the impact of interventions designed to align these perceptions, and extending the research to other disciplines and contexts.

However, the study has limitations. The self-reported nature of the data may introduce bias, and the findings are context-specific, limiting their generalizability. Future studies could address these limitations by incorporating objective competency measures and expanding the study to diverse contexts.

In conclusion, this study contributes significantly to understanding perceived competency levels in technology education. It provides a road map for enhancing teaching and learning outcomes and offers valuable insights for educators, curriculum developers, and policymakers in technology education.

References

1) Meinck S, Fraillon J, Strietholt R, editors. The impact of the COVID-19 pandemic on education: International evidence from the Responses to Educational Disruption Survey (REDS). 1.UNESCO & International Association for the Evaluation of Educational Achievement. 2022. Available from: https://unesdoc.unesco.org/ark:/48223/pf0000380398.
2) Tran TK, Dinh H, Nguyen H, Le DN, Nguyen DK, Tran AC, et al. The Impact of the COVID-19 Pandemic on College Students: An Online Survey. *Sustainability*. 2021;13(19):1–19. Available from: https://doi.org/10.3390/su131910762.
3) Hayashi R, Garcia M, Sudarshana HD, Jayasundara A, Balasuriya A, Hirokawa T. COVID-19 Impact on Technical and Vocational Education and Training in Sri Lanka. *ADB Briefs*. 2021;p. 1–8. Available from: https://www.adb.org/sites/default/files/publication/683046/adb-brief-168-covid-19-impact-tvet-training-sri-lanka.pdf.
4) Coman C, Ţîru LG, Meseşan-Schmitz L, Stanciu C, Bularca MC. Online Teaching and Learning in Higher Education during the Coronavirus Pandemic: Students' Perspective. *Sustainability*. 2020;12(24):1–24. Available from: https://doi.org/10.3390/su122410367.
5) Contreras CP, Picazo D, Cordero-Hidalgo A, Chaparro-Medina PM. Challenges of Virtual Education during the COVID-19 Pandemic: Experiences of Mexican University Professors and Students. *International Journal of Learning, Teaching and Educational Research*. 2021;20(3):188–204. Available from: https://doi.org/10.26803/ijlter.20.3.12.

6) Xiong J, Lipsitz O, Nasri F, Lui LMW, Gill H, Phan L, et al. Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *Journal of Affective Disorders*. 2020;277:55–64. Available from: https://doi.org/10.1016/j.jad.2020.08.001.
7) Cao W, Fang Z, Hou G, Han MK, Xu X, Dong J, et al. The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Research*. 2020;287:1–5. Available from: https://doi.org/10.1016/j.psychres.2020.112934.
8) Nguyen TH, Netto CLM, Wilkins JF, Bröker P, Vargas EE, Sealfon CD, et al. Insights Into Students' Experiences and Perceptions of Remote Learning Methods: From the COVID-19 Pandemic to Best Practice for the Future. *Frontiers in Education*. 2021;6:1–9. Available from: https://doi.org/10.3389/feduc.2021.647986.
9) Almahasees Z, Mohsen K, Amin MO. Faculty's and Students' Perceptions of Online Learning During COVID-19. *Frontiers in Education*. 2021;6:1–10. Available from: https://doi.org/10.3389/feduc.2021.638470.
10) Toro D. Academic Performance, Grade Inflation And Regulatory Exceptions In Higher Education During The Pandemic. In: 15th annual International Conference of Education, Research and Innovation, 7-9 November, 2022, Seville, Spain. ICERI2022 Proceedings;IATED. 2022;p. 3990–3994. Available from: https://library.iated.org/view/TORO2022ACA?re=downloadnotallowed.
11) Karadağ E. Effect of COVID-19 pandemic on grade inflation in higher education in Turkey. *PLOS ONE*. 2021;16(8):1–16. Available from: https://doi.org/10.1371/journal.pone.0256688.
12) Contreras A. Inflated honors. 2021. Available from: https://www.manilatimes.net/2021/08/14/opinion/columns/inflated-honors/1810901.
13) Goss H. Student Learning Outcomes Assessment in Higher Education and in Academic Libraries: A Review of the Literature. *The Journal of Academic Librarianship*. 2022;48(2):102485. Available from: https://doi.org/10.1016/j.acalib.2021.102485.
14) Rotar O. Online student support: a framework for embedding support interventions into the online learning cycle. *Research and Practice in Technology Enhanced Learning*. 2022;17(1):1–23. Available from: https://doi.org/10.1186/s41039-021-00178-4.
15) Dayagbil FT, Palompon DR, Garcia LL, Olvido MMJ. Teaching and Learning Continuity Amid and Beyond the Pandemic. *Frontiers in Education*. 2021;6:1–12. Available from: https://doi.org/10.3389/feduc.2021.678692.
16) Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative Research in Psychology*. 2006;3(2):77–101. Available from: https://doi.org/10.1191/1478088706qp063oa.
17) Remote Learning. Rapid Evidence Assessment. 2020. Available from: https://edtechhub.org/wp-content/uploads/2020/04/Remote_Learning_Rapid_Evidence_Assessment.pdf.
18) Ironsi CS. Navigating learners towards technology-enhanced learning during post COVID-19 semesters. *Trends in Neuroscience and Education*. 2022;29:1–7. Available from: https://doi.org/10.1016/j.tine.2022.100189.
19) Cherry K. The Experiential Learning Theory of David Kolb. 2022. Available from: https://www.verywellmind.com/experiential-learning-2795154.
20) Gao X, Li P, Shen J, Sun H. Reviewing assessment of student learning in interdisciplinary STEM education. *International Journal of STEM Education*. 2020;7(1):1–14. Available from: https://doi.org/10.1186/s40594-020-00225-4.
21) Kerrigan J, Andres D. Technology-Enhanced Communities of Practice in an Asynchronous Graduate Course. *Journal of Educational Technology Systems*. 2022;50(4):473–487. Available from: https://doi.org/10.1177/00472395221079288.
22) Mukhalalati BA, Taylor A. Adult Learning Theories in Context: A Quick Guide for Healthcare Professional Educators. *Journal of Medical Education and Curricular Development*. 2019;6:1–10. Available from: https://doi.org/10.1177/2382120519840332.
23) Bozkurt A, Sharma RC. Emergency Remote Teaching in a Time of Global Crisis Due to Coronavirus Pandemic. *Asian Journal of Distance Education*. 2020;15(1):i–vi. Available from: https://www.asianjde.com/ojs/index.php/AsianJDE/article/view/447.
24) Kong Y. The Role of Experiential Learning on Students' Motivation and Classroom Engagement. *Frontiers in Psychology*. 2021;12:1–4. Available from: https://doi.org/10.3389/fpsyg.2021.771272.
25) Hobson AJ, Maxwell B, Káplár-Kodácsy K, Hotham E. The Nature And Impact Of Effective Mentoring Training, Education And Development (MTED) . 2020. Available from: https://cris.brighton.ac.uk/ws/portalfiles/portal/21916643/ETF_MTED_Final_Report_Hobson_et_al_2020_Final_AH_30_Nov.pdf.
26) Misirli O, Ergulec F. Emergency remote teaching during the COVID-19 pandemic: Parents experiences and perspectives. *Education and Information Technologies*. 2021;26(6):6699–6718. Available from: https://doi.org/10.1007/s10639-021-10520-4.
27) Ali W. Online and Remote Learning in Higher Education Institutes: A Necessity in light of COVID-19 Pandemic. *Higher Education Studies*. 2020;10(3):16–25. Available from: https://www.ccsenet.org/journal/index.php/hes/article/view/0/42784.
28) Jandrić P, Hayes S. The postdigital challenge of redefining academic publishing from the margins. *Learning, Media and Technology*. 2019;44(3):381–393. Available from: https://doi.org/10.1080/17439884.2019.1585874.
29) Seery K, Barreda AA, Hein SG, Hiller JL. Retention strategies for online students: A systematic literature review. *Journal of Global Education and Research*. 2021;5(1):72–84. Available from: https://digitalcommons.usf.edu/cgi/viewcontent.cgi?article=1105&context=jger.
30) Pedro LFMG, Barbosa CMMDO, Santos CMDN. A critical review of mobile learning integration in formal educational contexts. *International Journal of Educational Technology in Higher Education*. 2018;15(1):1–15. Available from: https://doi.org/10.1186/s41239-018-0091-4.