



The Impact of English Language Proficiency on Coding Skills and Academic Performance in Computer Engineering Students

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Abstract. *The global nature of technology and information exchange has made English proficiency an essential skill for students in technical fields, including Computer Engineering. This study investigates the correlation between English language proficiency and academic performance, particularly coding skills, among Computer Engineering students. The research aims to determine whether a higher command of English contributes to better understanding and application of coding concepts, leading to improved academic outcomes. Utilizing a mixed-methods approach, this study collects data from both language proficiency assessments and academic performance records, with qualitative insights gathered from student interviews and coding task observations. The findings highlight that English proficiency, especially in technical vocabulary and comprehension, has a positive influence on coding abilities and overall academic success. This research underscores the importance of integrating English language development within technical curricula to enhance students' competency in globalized technical environments.*

Keyword: English proficiency, coding skills, academic performance, Computer Engineering, technical vocabulary, language and coding

Introduction

In the era of rapid technological advancement, English has emerged as the lingua franca of the globalized world, influencing various professional domains, including Computer Engineering. As the language of international academia, research, and technical documentation, English is crucial for students in technical fields, enabling access to knowledge and professional growth. For Computer Engineering students, proficiency in English is not only a means of communication but also a vital skill in understanding and applying complex technical concepts.

Despite the increasing importance of English in technical fields, there is limited research exploring its specific impact on coding skills and academic performance in Computer Engineering. Students often encounter challenges in understanding programming resources, documentation, and error messages, which are predominantly available in English (Shelly & Vermaat, 2011). Furthermore, programming languages such as Python, Java, and C++ are rooted in English syntax, making language proficiency essential for effective coding (Veerasamy & Shillabeer, 2014).

This research investigates the extent to which English proficiency influences coding skills and academic performance among Computer Engineering students. The objective is to provide empirical evidence on the importance of integrating English language support into technical curricula to enhance students' competencies.

This study is significant for educators and policymakers aiming to improve the global competitiveness of graduates in technical fields. Understanding the role of English proficiency in technical education can guide curriculum development, ensuring students are better prepared for a multilingual, globalized workforce. Moreover, identifying specific areas where language skills intersect with coding competencies can help institutions provide targeted support, enabling students to overcome linguistic barriers in technical learning.

Existing literature emphasizes the importance of English language proficiency in academic and professional success. Andrade (2009) highlighted how English proficiency affects students' adjustment to university life, including their academic performance. In the context of Computer Science, Veerasamy and Shillabeer (2014) explored how non-native English speakers face unique challenges in programming courses due to language barriers.

This study builds on prior research by examining how English proficiency impacts not only general academic performance but specifically coding-related subjects. Unlike previous studies that focus broadly on language learning (Gardner & Lambert, 1972), this research delves into the practical aspects of coding education, such as reading technical documentation and understanding error messages. By analyzing both quantitative and qualitative data, it provides a more nuanced understanding of the relationship between language skills and technical education.

While previous studies have examined the role of English in general educational contexts (Carhill et al., 2008), few have focused on its specific impact on coding skills in Computer Engineering. This research addresses this gap by exploring the correlation between language proficiency and coding performance, with an emphasis on technical vocabulary and comprehension. It also investigates students' experiences with English-language resources, providing practical insights for curriculum development.

In summary, this study explores the intersection of English proficiency and technical aptitude in Computer Engineering, hypothesizing that higher language skills correlate with improved coding capabilities and academic achievements. The findings aim to support the development of more inclusive educational strategies that integrate language and technical skill development.

Research Method

This study employs a mixed-methods approach to investigate the impact of English language proficiency on coding skills and academic performance among Computer Engineering students at Politeknik Unggulan Cipta Mandiri. By combining quantitative and qualitative data collection, the research aims to provide an in-depth understanding of how English proficiency influences students' ability to engage with coding concepts and excel academically.

Literature Review on Methodology

Previous studies have demonstrated the effectiveness of mixed-methods approaches in examining complex relationships in educational research. Creswell and Plano Clark (2011) emphasized the importance of integrating quantitative and qualitative data to gain a comprehensive understanding of research problems. Similarly, Veerasamy and Shillabeer (2014) applied a mixed-methods approach to study the challenges faced by non-native English speakers in programming courses, highlighting the interplay between language proficiency and technical skill development. These studies validate the appropriateness of using mixed methods for this research.

Participants

The study's participants consist of 80 Computer Engineering students from Politeknik Unggulan Cipta Mandiri, selected using purposive sampling to ensure diverse proficiency levels in English. The participants are categorized into three groups—high, intermediate, and low English proficiency—based on scores from a standardized English language assessment, specifically tailored to evaluate both general and technical English skills relevant to programming and computing contexts.

Data Collection Instruments

To comprehensively address the research questions, data is collected using the following instruments:

1. **Standardized English Proficiency Test:** A recognized English assessment test that evaluates students' reading comprehension, listening, and technical vocabulary in programming contexts is administered to classify students' language proficiency. This approach aligns with methodologies utilized by Carhill et al. (2008) and Nallaya (2012), which emphasize the role of standardized tests in assessing language skills.
2. **Academic Performance Data in Coding-Related Courses:** Academic records in subjects directly related to coding—such as Introduction to Programming, Data Structures, and Software Engineering—are obtained to serve as indicators of coding skills and overall academic performance. This approach is supported by studies like Andrade (2009), which used academic records to correlate language proficiency with student performance.
3. **Semi-Structured Interviews:** A subset of students from each proficiency group participates in semi-structured interviews to gain deeper insights into their experiences with English-language resources in programming. These interviews draw on methodologies recommended by Lightbown and Spada (1999), who advocate qualitative approaches to understand student experiences and perceptions.

Data Analysis

The study's data analysis combines quantitative and qualitative techniques to ensure a thorough understanding of the research topic:

1. **Quantitative Analysis:** Statistical analyses, including Pearson correlation and Analysis of Variance (ANOVA), are conducted to explore the relationship between English proficiency levels and academic performance in coding-related courses. The use of descriptive and inferential statistics follows recommendations by Eysenck and Keane (2015).

2. **Qualitative Analysis:** Interview transcripts are coded thematically to identify recurring themes and patterns regarding students' challenges, perceptions, and the practical influence of English proficiency on their coding studies. This approach aligns with thematic analysis techniques described by Braun and Clarke (2006).

Reliability and Validity

To enhance the reliability and validity of the study, several methodological safeguards are implemented. The standardized English proficiency test is a validated tool that accurately assesses language skills, especially in technical contexts (Brown, 2007). Academic performance data is sourced from official records, ensuring authenticity and consistency. For the qualitative component, interview questions are pilot-tested and refined to improve consistency in data gathering. Data triangulation between quantitative and qualitative sources further strengthens the research findings, offering a holistic perspective on the impact of English proficiency.

Limitations

The scope of this study is limited to Computer Engineering students at Politeknik Unggulan Cipta Mandiri, potentially affecting the generalizability of findings to other institutions or fields. Additionally, the study relies on academic records to evaluate coding skills, which may not fully capture hands-on or practical coding competencies. Future research could include a broader sample across institutions and utilize direct coding assessments for a more comprehensive analysis.

Findings and Discussion

This section presents the findings and discussion of the research on the impact of English language proficiency on coding skills and academic performance among 80 Computer Engineering students at Politeknik Unggulan Cipta Mandiri. The data collected includes both quantitative and qualitative information derived from English proficiency tests, academic performance records, and student interviews.

1. Relationship Between English Proficiency and Academic Performance in Coding

The findings from this study show a clear relationship between English language proficiency and academic performance in coding-related subjects. The respondents were divided into three groups based on their English proficiency test scores: High Proficiency (scores above 85%), Intermediate Proficiency (scores between 60-85%), and Low Proficiency (scores below 60%). The analysis revealed significant differences in GPA for coding subjects across these groups.

High Proficiency Group

Out of the 80 respondents, 25 students (31.25%) fell into the high proficiency group. This group exhibited the highest academic performance, with an average GPA of **3.8** in coding courses such as Programming Fundamentals, Algorithms, and Data Structures. These students demonstrated a strong understanding of technical terms, were able to read and interpret English-language documentation, and solved coding problems with relative ease.

One high proficiency student explained:

“I often use English resources like Stack Overflow and GitHub to troubleshoot and learn new techniques. Having a good understanding of English allows me to solve coding problems more efficiently and independently.”

The strong relationship between English proficiency and academic performance is further confirmed by the correlation coefficient of $r = 0.72$, suggesting a significant positive correlation.

Intermediate Proficiency Group

The intermediate proficiency group consisted of 35 students (43.75%), with an average GPA of **3.3** in coding-related courses. While these students performed moderately well, they faced difficulties in understanding more complex coding concepts and documentation in English. Many students in this group expressed that they struggled with technical vocabulary and had to spend additional time translating terms or seeking help from peers and instructors.

A student from this group shared:

“I can manage the basics, but sometimes I don’t fully understand what the English documentation says, especially when I encounter complex coding errors. It takes me longer to fix problems.”

The correlation between English proficiency and GPA in this group was $r = 0.56$, indicating a moderate but still notable positive relationship.

Low Proficiency Group

The low proficiency group consisted of 20 students (25%) who had an average GPA of **2.8** in coding subjects. Students in this group faced the most challenges, particularly with reading and understanding English-language coding resources. These students often struggled with reading technical documents, interpreting error messages, and finding solutions to coding problems. Their academic performance in coding courses was significantly lower, and many of them required frequent assistance from faculty or classmates.

One student from this group explained:

“I often don’t understand the error messages, and it’s hard to find solutions because most resources are in English. I spend a lot of time translating things.”

The correlation coefficient for this group was $r = 0.38$, indicating a weaker but still discernible relationship between English proficiency and coding performance.

2. Impact of English Proficiency on Coding Skills Development

Qualitative data from the interviews revealed that English proficiency played a critical role in developing coding skills. Students with high English proficiency reported that their ability to read and comprehend English-language coding tutorials, documentation, and error messages greatly facilitated their learning process. They were also able to engage with international coding communities and participate in online forums, which enhanced their coding abilities.

One high-proficiency student noted:

"Being able to understand English helps me stay updated with the latest coding trends. I regularly read articles and watch tutorials in English, which helps me improve my coding skills."

In contrast, students with low proficiency in English reported that their limited understanding of English hindered their progress in coding courses. These students often found themselves relying on translated resources or seeking help from peers, which could delay their learning.

A student from the low proficiency group shared:

"When I don't understand something in English, I have to ask someone else to explain it. It takes more time, and sometimes I feel like I'm missing out on learning opportunities."

3. Influence of Technical Vocabulary on Coding Success

A recurring theme from the interviews was the challenge posed by technical vocabulary in coding courses. Students with high English proficiency found it easier to grasp technical terms and concepts such as "function," "syntax," "debugging," and "algorithm." Their ability to understand these terms allowed them to navigate coding tasks more efficiently and perform better in assignments and exams.

One student with high proficiency explained:

"When I read programming documentation, I already know most of the technical terms, so it's much easier to follow along."

However, for students with intermediate and low English proficiency, unfamiliarity with technical vocabulary often led to confusion and mistakes when coding. These students expressed frustration at not being able to fully understand the terminology used in textbooks and online resources.

A student from the low proficiency group mentioned:

"When I see a word like 'parameter' or 'constructor' in the coding documentation, I don't know what it means, and that makes it harder to understand the code."

4. Access to Global Resources and Learning Opportunities

Another key finding was the influence of English proficiency on students' ability to access global resources, which is essential for learning and improving coding skills. High proficiency students were more comfortable using English-based platforms like Stack Overflow, GitHub, and online coding challenges to solve problems and improve their coding knowledge.

One student with high proficiency stated:

"I use GitHub to share my code and learn from others. I also participate in coding challenges in English. This helps me improve my skills and build a network of developers."

On the other hand, students with low proficiency in English often found it difficult to navigate these platforms. They relied on local resources, which were fewer and often less comprehensive, limiting their ability to learn from a global coding community.

A low proficiency student noted:

“I only use local resources in my language because I don’t understand much of the content on international platforms. It’s frustrating because there’s so much more out there that I can’t access.”

5. Educational Implications and Curriculum Recommendations

The findings highlight the significant impact of English proficiency on coding skills and academic performance in technical courses. To bridge the gap, it is recommended that Politeknik Unggulan Cipta Mandiri implement a curriculum that incorporates both technical and language training. Providing English language support, particularly focusing on technical vocabulary, will enhance students' abilities to access global resources, improve their coding skills, and perform better academically.

It would be beneficial for the institution to offer specialized English courses aimed at enhancing students' technical language proficiency. Additionally, faculty members could integrate more English-language materials into their teaching to help students become more familiar with coding terminology and online resources.

Conclusion

The findings of this study clearly demonstrate the significant impact of English language proficiency on coding skills and academic performance in coding courses among Computer Engineering students at Politeknik Unggulan Cipta Mandiri. Based on data from 80 students, a strong positive correlation was found between English proficiency and both coding skills and overall academic performance. Students with higher English proficiency exhibited better GPAs, a stronger understanding of technical terminology, and greater ease in accessing and utilizing global resources for coding.

Comparison with Previous Studies

This research aligns with studies by Veerasamy and Shillabeer (2014), who highlighted the challenges non-native English speakers face in programming due to language barriers. Similar to their findings, this study emphasizes the role of technical vocabulary and comprehension in coding success. However, unlike Andrade (2009), which focused on general academic performance, this research narrows its scope to coding-related subjects, offering a more detailed analysis of how language skills intersect with technical education. In contrast to Carhill et al. (2008), which explored adolescent English learners, this study investigates a higher education context, expanding the understanding of language proficiency in specialized academic fields.

Educational Implications

The study’s results underline the importance of integrating English language support into technical education curricula. Providing targeted language training, particularly focused on technical vocabulary, can help bridge the gap for students with lower English proficiency. Institutions could also encourage the use of English-language resources and platforms, such as GitHub and Stack Overflow, to enhance students' coding skills and global competitiveness.

Recommendations for Future Research

Future studies could broaden the scope by including diverse academic institutions and disciplines, employing hands-on coding assessments to complement academic records, and exploring additional factors such as cultural background and learning strategies that might influence the relationship between language proficiency and coding abilities.

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