Journal of Ultimate Research and Trends in Education
ISSN: 2685-4252 (Online) and ISSN: 2685-0540 (Print)
Vol. 6, No. 3, November 2024, pp: 189 – 204
DOI: https://doi.org/10.31849/utamax.v6i3.20420

English as a Coding Catalyst: Exploring Its Impact on Basic Programming Learning Outcome in Health Information Management

Erna Adita Kusumawati*, Trismianto Asmo Sutrisno, & Wengker Wengker
STIKes Mitra Husada Karanganyar, Karanganyar, Indonesia
ernaadita@gmail.com

ARTICLE HISTORY

Received : 2024-05-27
Revised : 2024-09-30
Accepted : 2024-10-13

KEYWORDS

Basic programming
Coding catalyst
English ability
Health information management
Learning outcome

ABSTRACT

This study addresses a critical gap in Health Information Management (HIM) education by exploring the relationship between English proficiency and basic programming learning outcomes, an area that has been underexplored despite the English-based nature of programming languages. Given that HIM professionals are increasingly expected to possess programming skills, understanding the role of English ability in this context is essential. A correlational research design was employed to examine this relationship, with statistical analysis including descriptive computations (mean, mode, median, variance, and standard deviation). Normality tests revealed non-normal data ($p = 0.018$), while linearity was confirmed ($p = 0.154$). The Spearman's Rho correlation test indicated no significant correlation between English ability and basic programming learning outcomes ($p = 0.174$). Although no direct correlation was found, the study highlights the pivotal role that English still plays in programming education, particularly through English for Specific Purposes (ESP) courses, which remain essential in vocational higher education. These findings contribute to a better understanding of the factors influencing programming education in HIM programs, offering valuable insights for curriculum development and teaching strategies. The results suggest that while English proficiency may not directly impact programming success, its integration into the curriculum is still important for fostering digital competence. In a broader context, this study has implications for refining HIM education, enhancing pedagogical approaches, and strengthening student support services, ultimately contributing to the development of healthcare professionals who are both digitally literate and linguistically adept.

1. Introduction

In the era of digital transformation, proficiency in programming languages has become a cornerstone for professionals across various fields including in Health Information Management (HIM) (Rohimajaya, et al., 2021). While the importance of programming for HIM professionals is well-established, the particular factors influencing programming learning outcomes within this context have not been comprehensively explored.

One particularly understudied area is the relationship between English ability and programming success. This research delves how English ability influences the learning outcome of basic programming skills in HIM students. Besides, it is also important to figure out what specific English elements that are most correlated with successful programming learning in HIM students. The hypothesis is that a strong foundation whether or not English can serve as a powerful catalyst, enhancing students' ability to grasp programming concept and write effective code. Given that most programming languages are English-based, it is plausible to hypothesize that a strong foundation in English could facilitate the acquisition of programming skills (Domenach, 2021).

The advent of the digital age has irrevocably transformed the landscape of healthcare (Tamrat, et al., 2022). From Electronic Health Records (EHRs) to telemedicine, technology has become an indispensable tool for delivering efficient, patient-centered care (Li, et al., 2021). At the heart of this digital revolution lies HIM, a field responsible for the accurate and timely management of healthcare data (Stanfill & Marc, 2019). To effectively navigate this complex digital environment, HIM professionals require a robust skill set that includes proficiency in information technology, particularly programming (Borycki, et al., 2024).

Programming, the process of creating software through coding, is increasingly recognized as a core competency for HIM professionals (Komkob et al., 2023). The ability to manipulate and analyze large datasets, develop applications for data management, and automate routine tasks can significantly enhance the efficiency and effectiveness of HIM operations (Adeleke, et al., 2015). Additionally, programming skills are essential for HIM professionals to collaborate effectively with IT departments and other healthcare professionals in developing and implementing innovative healthcare solutions (Al Kiyumi, 2015).

In health vocational higher education, English ability plays an essential role during the study, particularly to support other subjects which are web or computer-based (Benidris & Ammar, 2018). Basic Programming is an important subject in Health Information Management Study Program since it relates to the health application development and particular software used to manage patient data, analyze, and facilitate clinical and administrative processes (Veerasamy & Shillabeer, 2014). Basic programming enables health professionals to develop, maintain, renew the health application which is suitable to the organization needs. Yet, By having basic programming skill, health professionals can explore valuable insight and better health decision making (Bjelan-Guska & Hasanbegovic, 2020).

Good programming understanding makes health professionals be able to contribute in the development of better health technology, such as mobile application, telemedicine, Internet of Things (IoT) in health sector, and AI based solution (Turnip & Dharma, 2016). It also improves data security and privacy through encryption, authentication, and access control, so the data are merely accessible for authorized parties (Agrahari, 2023).

HIM involves data integration from various systems, such as electronic medical record, financial systems, and others (Arifin et al., 2016). Basic programming enables complex processes and analysis, such as statistical model, logarithm machine learning, and visual data analysis (Boswell, et al., 2022). HIM considers privacy and security data patients as confidential an become top priority (Sofia, et al., 2022). In healthcare, protecting patient privacy and securing their data is paramount (Fenton, et al., 2017). This is where HIM comes in to ensure that patient data is handled confidentially, securely, and in accordance with regulation like HIPPA (Health Insurance Portability and Accountability Act) (Shah, 2023).

One of skills required by a programmer is English ability (Alaofi, 2020). English, is the most frequent language used in the world and is the mother tongue for more than 400 million people, as well as becomes official language for 53 countries (Hamka, 2022). Thus, English is the first foreign language taught in Indonesia from the elementary school until college (Rahmah, 2023). English is considered as a powerful tool to transmit cultural knowledge evolving with thinking and reasoning capacities (Fedorenko et al., 2024). English is also used to capture message from other and express feelings and thoughts to others (Mulyasa, 2012; Muin, 2015).

Learning English means learning productive skills (writing and speaking) and receptive skills (reading and listening) (Masduqi, et al., 2023). Those four-skill learning is accompanied by learning language element like structure (rules), vocabulary (meaning), and pronunciation (sound). Vocabulary is one of the important language elements in English mastery (Al Anis, et al., 2021). The successful programmers highly depend on their communication to the codes through English for Specific Purposes (ESP) (Mykytenko et al., 2019). So, the course of ESP comprising of particular vocabulary in vocational higher education must be developed to train prospective programmers (Shandra, 2021). The English ability is a unity that relates language skills and elements (Tarigan, 2013). It develops through teaching and learning process, practice, experience, and exploration. Individual can improve and develop their ability through conscious efforts and dedication to master the language (Susilawati, 2022).

The global healthcare landscape is undergoing rapid digital transformation, with countries worldwide investing in electronic health records and other health information systems (Barbieri, et al., 2023). Consequently, the demand for skilled HIM professionals with programming expertise is growing globally (Retnowati, et al., 2024). On the other way round, to meet the qualification of skillful HIM professionals, a lot of countries particularly those where English is not the primary language still encounter English ability barriers (Feijoo-Garcia, 2020).

By examining the impact of English ability on programming comprehension, problem solving skills, and overall learning outcomes, educators and policy makers can develop strategies to support students from diverse linguistic backgrounds (Adnan, et al., 2018). Besides, good English ability can contribute to the global development of a skilled HIM workforce (Becker, 2019). Hence, this study aims to provide valuable insights for educators, curriculum developers, and HIM professionals seeking to optimize their learning and development strategies.

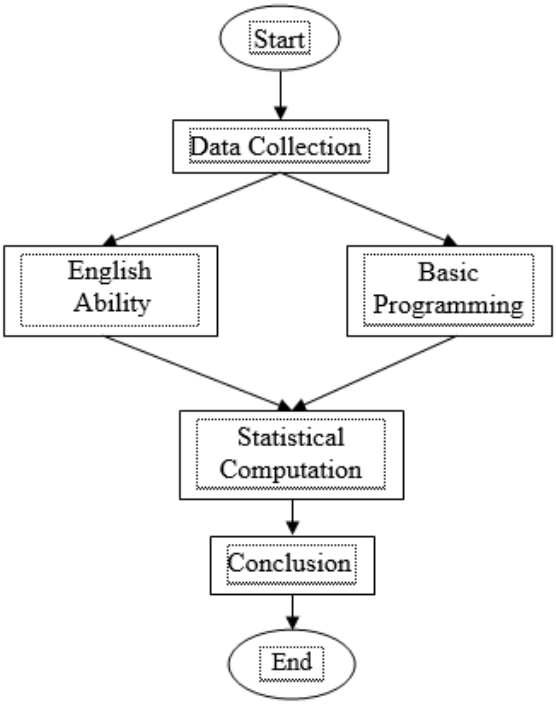
2. Method

2.1 Design

The study was aimed at examining the relationship between English ability and the learning outcome of basic programming toward HIM students. It adopted correlation research design since it looked at the relationship between two or more variables (Siswanto & Suyanto, 2018).

It was to know the presence or absence of the relationship between the two variables – not the causal relationship (McCombes, 2019). The researchers measured and analyzed the statistical relationship between independent variable (English ability) and dependent variable (basic programming learning output) without any interfere from other variables (Kusumastuti, 2020). It was a non-experimental type of quantitative study so the researchers did not manipulate and control variables with a scientific methodology and merely measured the relationship between the variables without altering them to external conditioning (Adirinekso, et al., 2024; Sugeng, 2022). In short, it only observed the variables naturally.

Table 1. The Flow of Study



2.2 Population and Sample

The population was the whole regular students from batch two of Applied Bachelor of Health Information Management study program STIKes Mitra Husada Karanganyar which were 35 students. The sampling technique applied was total sampling since the total population was less than 100. So, the sample were 35 students. The researchers selected a part from a whole in order to make inferences about the entire population (Sugiyono, 2019).

2.3 Data Collection and Instruments

The data were collected through archival data. This method used in correlational study that involved information user and other information about the variables that had already been gathered for some other purposes (Pelham, et al., 2005). It meant the data taken from existing data (Supomo, 2018). By using data from historical records (secondary data) of the variables, the researchers could analyze them directly (Jogiyanto, 2012). The data were derived from the institutional archive in a form of scoring rubric for TOEFL and Basic Programming subject. These rubrics were compulsorily submitted by each lecturer in the end of semester containing the scores of mid semester, assignment, presence, and final examination. These data were still relevant since they were taken from the same students for different subjects. Meanwhile, the instrument utilized in this study was documentation in which the data were collected based on written documents (scoring rubrics) which used to analyze the relationship between English ability and Basic Programming learning outcome.

In conducting this study, there were still practical limitations like heterogeneity of English ability level, access to standardized English test, variation in curriculum and assessment, students' motivation and interest as well as their prior experiences. Addressing these practical limitations required careful planning and consideration during the research design and data collection process. It might need further study to mitigate these challenges. Thus, correlation was employed in this study to anticipate these confounding variables since there were merely two variables considered.

2.4 Data Analysis

The data were taken from the learning outcome of Basic Programming dan the English ability that was gained from the learning outcome of TOEFL subject. The mean, modes, median, variance, and standard deviation then were computed using descriptive analysis. Initially, it was generated normality and linearity test. Afterward the correlation test was conducted through Spearman's Rho.

2.5 Procedure

There were two pre requisite tests to conduct correlation test i.e. normality test and linearity test. The normality test was used to ensure that the variables tested were normally distributed by using Kolmogorov-Smirnov. Meanwhile, the linearity test needed to conduct as one of the requirements to do regression test. If the data were not linear, the regression analysis could not be done. The linearity test was measured through F test with the hypothesis H0 meant the data were not linear and H1 meant the data were linear. Then the value of F observation was compared to the value of F table. If F observation was less then F table, it meant H0 was accepted, and that of F observation was beyond the F table, it meant H0 was rejected.

If the normality and linearity tests were significant, then the correlation test was conducted by using Pearson Product Moment and if one of the pre requisite tests was not significant, the correlation test was conducted by using Spearman's rho.

Hypothesis

H0: There was no correlation between students' English ability with students' basic programming learning outcome

H1: There was correlation between students' English ability with students' basic programming learning outcome.

The data were computed using SPSS in which then the result was used to draw conclusion.

3. Result

As previously stated, this study was aimed at investigating the relationship between English ability and basic programming learning outcome toward HIM students. The data used were the final score of TOEFL subject and that of Basic Programming as presented in Table 2. In this context, TOEFL subject was chosen as the representation of English ability due to its reputation as the representative measure of English skills.

The score of TOEFL and Basic Programming subject were obtained during one semester teaching and learning activities. The scores referred to the final score of each subject consisting of 14 meetings, midterm test, assignment, and final examination.

Table 2. The Learning Outcome Score of TOEFL Subject and Basic Programming

No	TOEFL Score	Basic Programming Score
1	2.74	3.16
2	2.87	3.33
3	3.51	4.00
4	3.50	3.87
5	2.75	3.25
6	3.00	3.00
7	2.74	3.00
8	2.50	3.24
9	2.50	3.87
10	2.87	3.99
11	3.25	3.33
12	3.16	2.99
13	3.00	3.25
14	3.66	4.00
15	2.74	3.33
16	2.75	3.50
17	2.49	3.08
18	2.74	3.99
19	2.50	4.00
20	3.25	3.33
21	2.74	4.00
22	3.25	4.00
23	2.99	3.87
24	3.33	3.87
25	2.74	4.00
26	3.33	3.24
27	3.42	3.66
28	2.74	3.99
29	3.50	3.33
30	3.50	4.00
31	3.50	3.24
32	3.33	3.66
33	3.66	3.50
34	2.74	3.87
35	2.99	3.50

Observing Table 2, the lowest score for English ability taken from TOEFL score was 2.49 and the highest score was 3.66. Meanwhile, the lowest and the highest score for Basic Programming surpassed the TOEFL score which were 2.99 for the lowest score and 4.00 for the highest one.

The descriptive statistic computation, was also conducted, as could be clearly seen in Table. 3, to describe the basic feature of the data, comprising of the mean (the average of data set), mode (the most frequent score in the data set, and median (the middle value when data set is ordered from the least to the greatest). Besides, it was also provided the variance referring the average squared deviations from the mean and the standard deviation referring to the square root of the variance. From total population which was 35, it was gained respectively the mean 3.04 and 3.58 for English ability (TOEFL) and Basic Programming. The value of mode was 2.74 for English ability and that of 4.00 for Basic Programming. Regarding the median, it was in the point 2.99 for English ability and that of 3.50 for Basic Programming. The value of Variance and Standard Deviation for English ability and Basic Programming respectively were 9.14, 3.02 and 12.65, 3.56.

Table 3. The Descriptive Statistic Computation of TOEFL and Basic Programming Score

Descriptive Statistic	TOEFL	Basic Programming
N	35	35
Mean	3.04	3.58
Mode	2.74	4.00
Median	2.99	3.50
Variance	9.14	12.65
St Dev	3.02	3.56

This study used a correlational research design to examine the relationship between English proficiency and basic programming learning outcomes. The design allowed for the observation of these variables without manipulation or control, with data collected from a natural setting. The sample consisted of 35 students from the HIM program at STIKes Mitra Husada Karanganyar, matching the total population size of fewer than 100 students.

English proficiency was measured using the TOEFL scoring rubric, while basic programming learning outcomes were assessed through a specialized rubric for programming. Both rubrics provided standardized methods for evaluating student performance in each area.

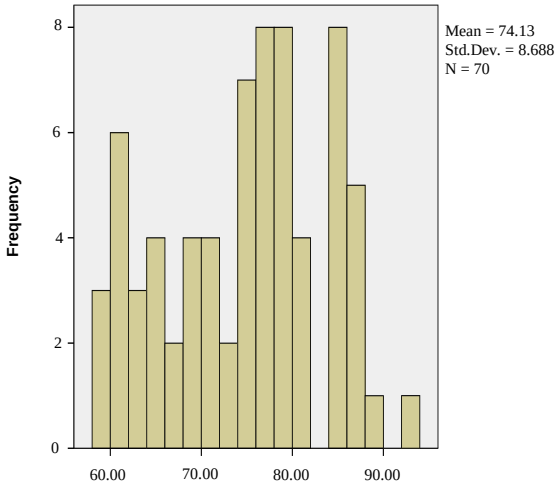
Before conducting correlation test, there were two pre requisite tests needed, i.e. normality and linearity test. These tests played significant roles in determining the appropriate statistical methods for correlational study. Moreover, these tests helped the researchers assess whether the data met the assumptions underlying correlation analysis and ensured that the results were valid and reliable.

The purpose of normality test was to determine if the data followed a normal distribution. It was done by using SPSS that could be observed in Table. 4. From the data it was obtained that the significant value of the data was 0.018 which was lower than 0.05 or significant. It showed that the data were not normally distributed. While the histogram and the polygon of distribution normality respectively could be seen in Table 5 and Table 6.

Table 4. The Normality Test

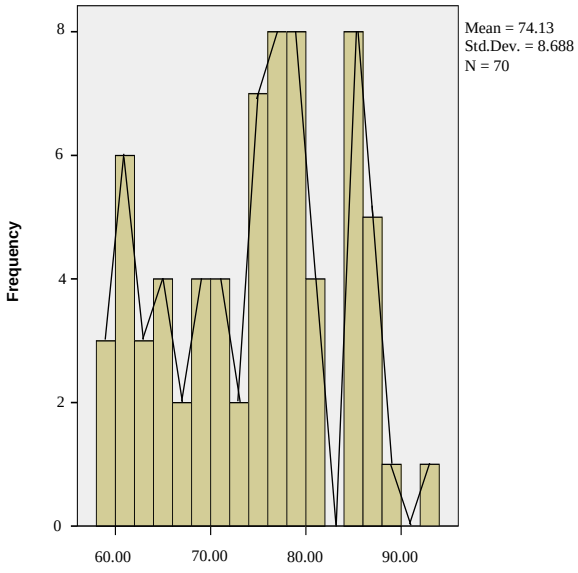
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
VAR00001	.097	70	.099	.957	70	**.018**

Chart 1. The Histogram of Data Normality



The mean and the standard deviation of the data were 74.13 and 8.688. The mean represented the central value of the data and the standard deviation measured the spread of the data points. The histogram indicated that the data points were not evenly distributed around the mean.

Chart 2. The Polygon of Data Normality



The polygon was graphical representation of the frequency distribution of the dataset (English ability and Basic Programming learning outcomes). It was created by connecting the midpoints of the tops of adjacent bars in the histogram. The rightward skew and leptokurtic shape suggested that there was a concentration of higher values and a presence of outliers.

The second pre requisite test was linearity test which was aimed at assessing whether the relationship between the variables was linear. It was done by using SPSS that could be seen in Table. 5. It showed that the value of linearity significance was 0.154 which was lower than 0.05 or significant meaning the data were linear.

Table 5. Linearity Test

	R	R Squared	Eta	Eta Squared
PEMROGRAMAN * TOEFL	.258	.067	.599	**.359**

Based on the both pre requisite tests, it could be clearly observed that the data distribution was not normal, while the linearity of both data was linear, so the most appropriate correlation test used was Spearman's Rho. It was to measure the strength and direction of the relationship between the variables (English ability and Basic Programming learning outcome). Table 6 showed the correlation test of Spearman's Rho by using SPSS.

Table 6. The Correlation Test

			VAR00001	VAR00002
Spearman's rho	VAR0 0001	Correlation Coefficient Sig. (2-tailed)	1.000	.235
			.	.174
		N	35	35
	VAR0 0002	Correlation Coefficient Sig. (2-tailed)	.235	1.000
			.174	.
		N	35	**35**

The result showed that the variables had no significant correlation since the value of p (0.174) was beyond 0.05. It meant there was no correlation between the English ability as the independent variable and the learning outcome of Basic Programming subject as dependent variables. So, English ability was found to indirectly influence basic programming outcomes through its mediating effect on problem-solving skills.

It was realized that the sample size was relatively small, limiting the generalizability of the findings. The correlational design also prevented from causal inferences during this study. Thus, this study focused on merely English ability and basic programming skill and might not capture the full extent of the relationship between English ability and more advanced programming concepts.

The research finding provided evident to support the hypothesis that English ability is an indirect catalyst for basic programming learning outcome in HIM. Additionally, the mediating role of problem-solving skills highlighted the importance of English ability in developing cognitive abilities necessary for successful programming.

The findings of this study demonstrated that English ability played as indirect catalyst in facilitating basic programming learning among HIM students. By addressing the limitations of the research and conducting further studies with larger sample sizes and longitudinal designs, future research can deepen our understanding of relationship between English ability and basic programming success in the field of Health Information Management.

4. Discussion

The increasing integration of technology in the healthcare sector has made proficiency in programming a crucial skill for HIM professionals (Lemeshchenko-Lagoda, 2020). However, for many students in this program, English ability can present a significant barrier to effective programming learning (Bagherian & Sattari, 2022).

This study aims to investigate the relationship between English ability and basic programming performance in HIM students by understanding the challenges encountered by students with limited English ability, this study seeks to identify strategies and interventions that can be implemented to enhance their programming learning experiences and improve overall outcomes in the field. Moreover, it examines the impact of English on programming comprehension and specific English skills that pose significant challenges for HIM students in learning basic programming and the English element that is related most to this issue.

Based on the Spearman's Rho computation on the Table.8, the Sig value was known (2-tailed) 0.174 > 0.05. So, it could be concluded that there was no correlation between the English ability and the learning outcome of Basic Programming subject.

Although there is no significant correlation between English ability and Basic Programming learning outcomes, English still plays a pivotal role in learning Basic Programming. Most programming languages, tools, and online resources are primarily documented in English. Besides, English is needed to understand programming concept and terminology. It could be said that English is a means of communication to understand the materials (Susilawati, 2022). A

strong grasp of English enhances students' ability to understand technical documentation, tutorials, and manuals. English ability also needed to effectively search for solutions to problems online (Mykytenko, et al. 2019).

This finding is similar to the previous study conducted by Dewi (2020) aimed at examining the correlation between English language abilities (taken from the score of TOEFL reading comprehension test) and object-oriented programming learning outcomes (taken from scores of quizzes, midterm test, and final test) in the Oracle Academy curriculum implementation for students in the Department of Informatics. The study showed that both variables had no significant correlation ($p>0.05$). So, it could be concluded that there was no correlation between English language abilities and the learning outcome of object-oriented programming in the implementation of Academy Oracle curriculum.

Although English ability plays important role in programming learning, it has limited empirical evidence to support the issue in this specific context. While there have been studies exploring the relationship between language ability and learning outcome in general, there is a scarcity of research that directly focuses on the impact of English on programming learning in the context of HIM. The healthcare domain has unique requirements and challenges in terms of programming, such as dealing with sensitive patient data and understanding medical terminology (Rani, et al., 2024). This necessitates research should specifically examines the role of English in this context.

In addition, the influence of English ability on learning basic programming has a complex issue with varying perspectives (Lertchalermtipakoon, 2021). While programming itself is considered as a logical and mathematical discipline, the medium instruction and the resources available significantly impact learning outcomes (Yeng, et al., 2023). Furthermore, code syntax is relatively consistent, meaningful variable and function names, comments, and code structure rely on clear language (Barbieri, et al., 2023). English ability aids in writing clean and understandable code (Retnowati, et al., 2024). Moreover, many programming errors result in English-language error messages. English ability helps students interpret these messages accurately and efficiently (Bjelan-Guska & Hasanbegovic, 2020).

Students will learn computer subject more easily if they have good English ability. Thus, English ability and computer learning are essential. The programming terms and instruction for running the programs are designed in English (Buryadi & Dina, 2014; Indra, 2012). Even most applications in analysis and data coding can solely be operated in English (Nastiti & Abdu, 2020). So, if students understand English better, it will be easy to catch the meaning.

By mastering the English terms for programming, students will get a prior insight on how the components of a programming language work (Benidris & Ammar, 2018). It is important to comprehend how programming features work since it will influence the way students create the program (Fitriawati, 2019). Therefore, English is the underlying language in information system development (Pan, 2022). In short, English ability is a primary capital as well as challenge in communication between programmers and the programs.

English ability based on the Common European Framework of Reference for Language (CEFR) covers six-point scale, i.e. Basic User consisting of Beginner (A1) and Pre-intermediate (A2); Independent User comprising of Intermediate (B1) and Upper-Intermediate (B2); and Proficient User covering Advanced (C1) ad Proficient (C2). It is an internationally recognized standard for describing language proficiency. These six levels are used as reference to assess students' English ability (Gopal, et al., 2023). This allows anyone involved in language teaching and testing (teachers and students) to determine the level of various qualifications (Fauzi, et al., 2024).

Accurately measuring English language ability can be challenging, particularly when dealing with diverse populations and varying levels of language exposure (Adityo, 2020). The choice of English language assessment tools can significantly impact the research findings. Moreover, defining and measuring basic programming learning outcomes in the context of HIM can be complex. This requires careful consideration of relevant skills and competencies.

English ability is usually taught to students through formal instructional activities in certain subjects (Azzolini, 2022). Unlike any other English language teaching in the colleges, in the level of vocational higher education, English subject, taught as ESP (English for Specific Purposes) (Lemeshchenko-Lagoda, 2020). It is categorized as general basic subject usually taught in early semester as compulsory subjects that become one of passing requirements (Andi, et al., 2016).

English language teaching in Applied Bachelor of Health Information Management Study Program in STIKes Mitra Husada Karanganyar is conducted in semester I (Introduction to Medical Terms), semester II (English for Health Information Management), semester III (Business English Conversation), semester IV (Business English Writing), and semester VII (Standardized Test Preparation referring to TOEFL subject). Each subject will point 2 credits.

As a part of general basic subjects in vocational higher education, English ability has an essential role in supporting other subjects like basic programming subject (Amara, et al., 2023). English language teaching in vocational higher education is based on the

needs of the students through popular approach i.e. English for Specific Purposes (ESP) (Fitria, 2023). This approach is in line with government policy that emphasizes on student ability improvement in using English particularly as academic and professional career development needs.

English language teaching in vocational higher education is aimed at preparing students with good English communication ability in workplace and broaden insight as well as explore knowledge related to computer and information technology (Andi, et al., 2016). Specifically, the graduates of this program are prepared to become qualified and skillful health professionals that are ready to compete globally (Hajar, et al., 2023).

In this case, the graduates are prepared to be professionals in implementing, developing, and sharing health technology, as well as using that technology to improve people's standard of living (Queipo, et al., 2024). Besides, they are demanded to fulfil the expectation to design and develop software application to support health facility service related to health information mapping, data analysis, INACBGs, Electronic Health Record (EHR), and many more (Saputra et al., 2024).

In the context of ELT in Vocational higher education, particularly for non-English major students, ESP is considered as a popular choice (Agustina, 2014). They have efforts to improve their English ability based on their specialties or certain subjects they focus on (Farahsani & Harmanto, 2022). As English is considered as a foreign language in Indonesia, ESP here focusses on English language enrichment to support certain knowledge like English for basic programming (Anthony, 2018). The primary focus of ESP is particular knowledge that students want to achieve (Woodrow, 2017). In other words, the ESP materials is more specific that of in general English (Basturkmen, 2015). It also strongly relies on the students' needs both materials and methodologies (Brown, 2016). The English teaching method applied could be, simulation, discussion, project-based learning, role play, and so forth. The materials delivered in the class are theme-based materials related to computer programming in health field particularly health information management (ESP) (Peacock, 2020).

Meanwhile, programming is an activity of instruction to computer to do certain tasks through the use of programming language, the programming language refers to instructions understood by the computer to do the tasks (Xie, 2019). A set of tasks done by the computers will become a program or software (Rasheed et al., 2023). The software itself is an instruction to computer written in codes of certain programming language that have been collected through appropriate compiler (Yalinda, 2018). Instruction received by computer may have different code structure syntax. However, the logic and the algorithm use are the same (Feijoo-Garcia et al., 2021). Thus, it is important to students to master the logic, algorithm, and programming language structure in order to be able to instruct computer to do certain tasks.

Basic programming is a concept and basic techniques used to develop computer program. It involves understanding about the core principles of basic programming, programming language, data structure, logarithm, and programming logic (Sutrisno & Kusumawati, 2022). Basic programming covers concepts like variable, data type, flow control (if, repetition, and condition), function and basic mathematic operation (Johnson et al., 2020). Furthermore, it also covers understanding on how to organize and manage program code, use data structure like array and object, and solve problems through logic steps (Swapna et al., 2023)

Basic programming is instructional activity that gives general logic basic and emphasizes on the formation of individual's thought pattern about effective and efficient program design so the those basic can be applied in any programming language anytime and anywhere, including in the health field (Yanti & Nurhayati, 2023). The use of programming language is varied based on the needs. As software develops rapidly, the need of programming language will also different (Thabroni, 2022).

Basic programming is an important foundation for students that want to learn advanced programming or develop application and software (Syaifudin et al., 2023). It will help understand more complex concepts and broaden ability to solve problems, and implement the solution in computer program.

Several programming languages usually used to learn basic programming are PHP, Python, Java, C/C++, Visual Basic, JavaScript, and many more. After understanding these basics, individual can continue to learn further topics like object-oriented program, web development, data basis, and more advanced topics (Yuana, 2022).

Programming language basically is categorized into two, i.e. low-level programming language and high-level programming language. Low level programming language is a programming language in which the syntax is difficult to understand by common people and it can only be understood by certain people, like machine language and assembly (Koolen, et al., 2019). Meanwhile, high level programming language has syntax that used daily by human so it can be read and learned in general, such as Java, Pascal, Python, and C/C (Djahir & Pratita, 2015).

Basic programming subject is a compulsory subject in Health Information Management study program in STIKes Mitra Husada Karanganyar which is taught in the third semester. This subject is delivered by using various method, such as lecturing, group discussion, practicum, project, and presentation.

In spite of the materials delivered by the lecturer, the students are also provided with tutorial video about programming application design created and presented by the lecturer of the subject. The video can be watched and downloaded in YouTube (*Pemrograman Web Dasar – Pertemuan 01*). Educational videos have become a crucial part in vocational higher education since it provides crucial content-delivery tool in both online learning and offline learning (Brame, 2016; Hamzah et al., 2021).

The teaching and learning activity through video are beneficial and flexible since it can be accessed anywhere and anytime as long as the internet connection is available. This method enables students to rewind the materials and follow the step-by-step tutorial provided (Lin et al., 2022)

The assessment in this subject is conducted comprehensively and continue in each meeting of the semester. The aspects assessed covers cognitive, affective, and psychomotoric. The test was conducted twice i.e. middle test and final examination. The type of test in the middle test is multiple choices, while that of in final examination is essay and practice of application program design.

Students having good English ability are expected to understand and master the application program design as stated in the learning objective. For instance, programming scripts typed to design certain application mostly use syntax in English, like addition (insert into, add), change (update, modify), delete (delete, destroy), condition (if, then), and repetition (for, while, do while) (Patel et al., 2022).

However, it needs to be considered as well the intervening factors influencing in this study, such as individual differences, curriculum and instruction (Cheng, 2021). Factors like prior programming experience, cognitive abilities, and learning styles can also influence programming learning outcome (Room et al., 2022). In addition, the quality of the programming curriculum and instructional methods can significantly impact learning outcomes (Corritore & Love, 2020). Thus, to fully understand the long-term impact of English ability on Basic Programming learning outcomes, longitudinal studies are needed that follow students over time.

Learning English improves logical thinking, which is essential for programming. Strong English ability can enhance problem-solving abilities by facilitating clear communication and understanding the problem statement (Endahati, 2023). Thus, it is obvious that English ability plays important role in supporting basic programming teaching and learning since the instructions and commands used in the programming language is English (Prayudha & Salihah, 2023). Good English ability enables students to explore information technology and computer that will create broader opportunity to develop professional career.

English is business and technology communication language that is dominantly used and becomes urgent need to fulfil (The English Language Center, 2013). Moreover, software company like Microsoft has used English as official language in the company. The same thing happens in other international company that obliged their employees to use English. Thus, in the work field particularly in the software development in health field, English cannot be denied that it is crucial (Haripriya et al., 2021).

Considering the importance of English on programming learning, this might practically imply to some issues on educators, curriculum developers, and policy makers. Educators should consider to integrate English instruction into basic programming courses (Bentahar & Cranker, 2021). This can help students develop the English skills necessary for understanding technical concepts, reading documentation, and communicating effectively with peers and colleagues. Programming concepts can be taught in a more engaging and meaningful way by using real-world examples and scenarios requiring students to use English (Hu, 2022). Furthermore, education can foster a collaborative learning environment where students work together on programming projects (Jung et al., 2021). This will not only improve their programming skills but also enhance their English ability through communication and teamwork (Poornesh et al., 2021).

Besides, the curriculum developers should ensure that programming curricula includes components that address English skills (Spante, et al., 2019). This could involve specific language lessons, vocabulary building activities, or opportunities for students to practice English in programming context. Curriculum developers should consider how to assess students' English skills as part of overall programming assessment (Lim, et al., 2020). This could be the use of language proficiency test.

Moreover, the policy makers should support English development support program for students who may need additional assistance in English language learning. This could include language courses, tutoring services, or online resource (Hinojosa, 2022). Then, policy makers need to invest in teacher training program or Teacher Professional Development (TPD) that equip educators with skills to teach programming effectively in English. It can be in a form of training on language-integrated learning strategies and the use of technology to support language learning.

The institution should be aware of the curriculum development that is suitable to the current demand of the healthcare workforce (Uehara & Kojima, 2021). Incorporate English ability into programming courses can address the needs of students with varying proficiency level. It can be done by developing specific programming assignments that integrate language skills and elements, such as writing code comments or creating technical documentation (Polat & Yilmaz,

2022). Besides, instruction strategies during the courses should be highlighted as well. By adopting ESP, the lecturers can utilize teaching methods that cater to students with different language background, like visual aids, hands-on activities, and peer-assisted learning (Nugraha et al., 2024). It needs to provide students opportunities to practice English skills in programming-related context, such as coding challenge or group projects (Lasheen, 2022).

In addition, it needs to develop assessment instruments that measure both programming knowledge and English ability, allowing for a more comprehensive evaluation of students' learning (Lakas & Belkacem, 2021). Offering additional English language support service, such as English tutoring or workshop to assist students overcome language barrier (Lord, 2019). Then, providing professional development opportunities for faculty members can enhance their understanding of language acquisition and effective teaching strategies for diverse learners (Kusumawati, 2024).

The finding facts that state there is no significant correlation between English ability and Basic Programming learning outcome in HIM students trigger some new insight and understanding into the English and programming education, particularly in the context of vocational higher education. It involves rethinking the role of language, tailoring curriculum and instructions, supplementing language support, and considering the cultural sensitivity and inclusivity (Stein-Smith, 2019). While English ability is undoubtedly important for communication and collaboration in programming field, it should be borne in mind that it may not be the sole predictor of success (Mbunge et al., 2021). Other cognitive skills, such as logical reasoning, problem-solving, and abstract thinking may play a more significant role in programming learning (Rajasekhar, 2022). Then, cultural factors such as different learning style or approaches to problem-solving may also influence programming outcomes (Khudarova et al., 2024).

Besides, educators may need to adopt more individualized approaches to teach programming recognizing that students have varying levels of English ability and different learning style (Schleiff et al., 2022). As English ability is not considered to be a direct predictor of programming success, providing supplementary language support can still be beneficial for students who may struggle with certain aspects of English, such as technical terminology or communication challenges (Anh et al., 2019). Language support programs should be tailored to the specific needs of programming students, focusing on language skills relevant to their field, such as reading technical documentation and writing code (Runge at al., 2023; Lubbers at al., 2019).

Further research and interdisciplinary collaborations are strongly recommended to gain a more nuanced and comprehensive understanding of the relationship between English ability and programming learning outcome in HIM that can explore other factors that influence programming learning outcome. Longitudinal studies to establish more definitive causal relationship need to consider in spite of research to gain a deeper understanding of the challenges and strategies in learning English and basic programming. By pursuing those researches, the results are expected can inform the development of effective strategies and interventions to support students' success in HIM field.

5. Conclusion

This study examined the relationship between English proficiency and basic programming learning outcomes among HIM students, with the key finding being that no significant correlation was found between the two variables. The statistical analysis, including the Spearman's Rho correlation test, revealed a p-value of 0.174, indicating that English proficiency does not directly influence programming success. While English ability may provide some advantages in understanding programming concepts, it does not serve as a determining factor for achieving successful learning outcomes. The results suggest that factors such as effective teaching strategies, practical experience, and student motivation play a more significant role in programming success. These findings challenge the assumption that strong English proficiency is essential for learning programming, particularly in vocational education settings like HIM.

Moreover, the study emphasizes the importance of language support tools, such as glossaries, bilingual instruction, and English for Specific Purposes (ESP) programs, which can aid students with varying levels of language proficiency. The research also highlights the value of practical programming exercises and continuous assessment in fostering problem-solving skills, independent of students' language ability. Looking ahead, future research could focus on the long-term effects of language interventions on programming outcomes, explore the role of cultural factors in programming education, and investigate how different programming languages may interact with language proficiency. Further studies could also refine teaching methodologies and explore bilingual or multilingual approaches to optimize both language and technical skills in HIM education.

6. Acknowledgement

This study was supported by STIKes Mitra Husada Karanganyar. The researchers thanked the colleagues in Applied Bachelor of Health Information Management Study Program for sharing knowledge, experiences, and unfailing support in accomplishing this study.

Reference

Adeleke, I. T., & et al. (2015). Information technology skills and training needs of health information management professionals in Nigeria: A nationwide study. *PubMed*, 44(1), 30-38. https://doi.org/10.1177/183335831504400104

Adirinekso, G. P., & et al. (2024). Metodologi penelitian kuantitatif. *Jambi: Sonpedia Publishing Indonesia*.

Adityo, A. (2020). Dynamics system analysis in measuring English language performance. *ELITE Journal*, 2(1), 1-8. Retrieved from https://www.elitejournal.org/index.php/ELITE/article/view/30

Adnan, M., & et al. (2018). Scaffolding computer programming languages learning with tailored English vocabulary based on learners' performance state. *EAI Endorsed Transactions on Scalable Information Systems*, 8(30), 1-17. https://doi.org/10.4108/eai.26-5-2020.166350

Agrahari, A. K., & et al. (2023). Two-factor authentication protocol for IoT-based healthcare monitoring system. *Journal of Ambient Intelligence and Humanized Computing*, 14, 16081–16098. https://doi.org/10.1007/s12652-022-038349

Agustina, T. (2014). English for specific purposes (ESP): An approach to English teaching for non-English department students. *Beta: Jurnal Tadris Matematika*, 7(1), 37-63. Retrieved from http://repository.uinmataram.ac.id/id/eprint/1789

Al Anis, & et al. (2021). English learning in mastering vocabulary using song lyrics in foreign language development institution (FLDI) Nurul Jadid Islamic Boarding School. *Jurnal TRILOGI*, 2(3), 355-359. https://doi.org/10.33650/trilogi.v2i3.2780

Al Kiyumi, R. H. M. (2015). Health information management professionals: Current status and future prospects. *Proceedings of the 1st Health Information Management Association (HIMA) India National Conference and Exhibits on HIM and IT*, 36-40. https://api.semanticscholar.org/CorpusID:79307559

Alaofi, S. (2020). The impact of English language on non-native English speaking students' performance in programming class. *Proceedings of the ACM Conference on Innovation and Technology in Computer Science Education*, 585-586. https://dl.acm.org/doi/10.1145/3341525.3394008

Amara, S., Li, Y., Wagner, C., Jin, S., Zhang, Z., & Edrington, C. (2023, October). High-Performance computing-based fast virtual prototyping of power electronics converters for ground vehicle powertrain systems. In *2023 North American Power Symposium (NAPS)* (pp. 1-6). IEEE.

Andi, M., & et al. (2016). From ESA to ESCAPE: A conceptual model for teaching English in vocational higher education. *Consortia Academia*, 5(4), 53-65. https://doi.org/10.5861/ijrsll.2016.1350

Anh, V. T. L., & et al. (2019). Design and implementation of empower English program online (EEPO) for students and learners of Ho Chi Minh City university of transport. *European Journal of Engineering and Technology Research (EJ-ENG)*, 4(9), 52-57. https://doi.org/10.24018/ejers.2019.4.9.1513

Anthony, L. (2018). *Introducing English for specific purposes*. Routledge.

Arifin, S., & et al. (2016). *Buku ajar dasar-dasar manajemen kesehatan*. Pustaka Benua.

Azzolini, D., & et al. (2022). Formal instruction vs informal exposure: What matters more for teenagers' acquisition of English as a second language? *Research Papers in Education*, 37(2), 153-181. https://doi.org/10.1080/02671522.2020.1789718

Bagherian, H., & Sattari, M. (2022). Health information system in developing countries: A review on the challenges and causes of success and failure. *Medical Journal of the Islamic Republic of Iran*, 36(111). https://doi.org/10.47176/mjiri.36.111

Barbieri, C., & et al. (2023). From electronic health records to clinical management systems: How the digital transformation can support healthcare services. *PubMed*, 16(11), 187-1884. https://doi.org/10.1093/ckj/sfad168

Basturkmen, H. (2015). *Developing Courses in English for Specific Purposes*. Springer.

Becker, B. A. (2019). Parlez-vous Java? Bonjour La Monde! = Hello World: Barriers to programming language acquisition for non-native English speakers. *30th Workshop of the Psychology of Programming Interest Group-PPIG 19*. Retrieved from www.brettbecker.com/publications

Benidris, M., & Ammar, H. (2018). The correlation between Arabic student's English proficiency and their computer programming ability at the university level. *International Journal of Managing Public Sector Information and Communication Technologies (IJMPICT)*, 9(1), 1-10. https://doi.org/10.2139/ssrn.3466182

Bentahar, A., & Cranker, K. (2021). Enhancing intensive English program reading and writing courses through integrated-skill activities.

GATESOL Journal, 31(1), 54-60. https://doi.org/10.52242/gatesol.113

Bjelan-Guska, S., & Hasanbegovic, N. (2020). Application possibilities of computer software in the context of the art teaching. *INSAM Journal of Contemporary Music, Arts, and Technology*, 1(4), 43-59. https://doi.org/10.51191/issn.2637-1898.2020.3.4.43

Borycki, E. M., & et al. (2024). Canada's digital health workforce: The role of innovation, research, and policy. *PubMed*, 19(312), 77-81. https://doi.org/10.3233/SHTI231316

Boswell, B., & et al. (2022). Using AI-based NiCATS system to evaluate student comprehension in introductory computer programming courses. *IEEE Frontiers in Education (FIE) Conference*, 1-8. https://doi.org/10.1109/FIE56618.2022.9962681

Brame, C. J. (2016). Effective educational videos: Principles and guidelines for maximizing student learning from video content. *CBE Life Sciences Education*, 15(4), es6. https://doi.org/10.1187/cbe.16-03-0125

Brown, J. D. (2016). *Introducing Needs Analysis and English for Specific Purposes*. Routledge.

Buryadi, I. Y., & Dina, E. (2014). Sistem pembelajaran bahasa Inggris terkomputerisasi. *STIMIK AKAKOM*. Retrieved from https://search-jogjalib.jogjaprov.go.id/Record/oai:opac.utdi.ac.id:slims-9846/Similar

Cheng, S. C., Cheng, Y. P., & Huang, Y. M. (2021). To implement computerized adaptive testing by automatically adjusting item difficulty index on adaptive English learning platform. *Journal of Internet Technology*, *22*(7), 1599-1607.

Corritore, C., & Love, B. (2020). Redesigning an introductory programming course to facilitate effective student learning: A case study. *Journal of Information Technology Education: Innovation in Practice*, 19, 91-135. https://doi.org/10.28945/4618

Dewi, L. J. E., & et al. (2020). Pengaruh kemampuan berbahasa Inggris terhadap hasil belajar pemrograman berorientasi objek pada implementasi kurikulum Oracle Academy. *Jurnal Pendidikan Teknologi dan Kejuruan*, 17(1), 115-124. https://doi.org/10.23887/jptk-undiksha.v17i1.23236

Djahir, Y., & Pratita, D. (2015). *Bahan ajar sistem informasi manajemen*. Deepublish.

Domenach, F., et al. (2021). Disrupting discipline-based learning: Integrating English and programming education. *Critical Inquiry in Language Studies*, *18*(1), 26–40. https://doi.org/10.1080/15427587.2020.1807986

Endahati, N. (2023). Do English education department students experience communication apprehension? An investigation of their level and strategies. *Journal of English Language Teaching and English Linguistics (ELTICS)*, *8*(1), 45–57. https://doi.org/10.31316/eltics.v8i1.4591

Farahsani, Y., & Harmanto, M. D. (2022). Teaching ESP using Myklass in Universitas Muhammadiyah Yogyakarta: Students' perception. *LLT Journal: A Journal on Language and Language Teaching*, *25*(2), 639–650. https://doi.org/10.24071/llt.v25i2.2994

Fauzi, T. N., et al. (2024). Mitigating respondent fatigue in self-assessment: CEFR-based items for Malaysian undergraduates. *Journal of Nusantara Studies (JONUS)*, *9*(2), 474–489. https://doi.org/10.24200/jonus.vol9iss2pp474-489

Feijoo-Garcia, P., et al. (2020). The effects of native language on block-based programming introduction: A work in progress with Hispanic population. *Research on Equity and Sustained Participation in Engineering, Computing, and Technology (RESPECT)*, 1–2. https://doi.org/10.1109/RESPECT49803.2020.9272513

Feijoo-Garcia, P., Chen, Y. P., Esmaeili, S., Ma, Y., & Gardner-McCune, C. (2021). Write2Code: Pen-based educational tool for Java. *International Journal of Emerging Technologies in Learning (iJET)*, *16*(3), 307–315. https://doi.org/10.3991/ijet.v16i03.17979

Fenton, S. H., et al. (2017). Health information management: Changing with time. *PubMed*, *26*(1), 72–77. https://doi.org/10.15265/IY-2017-021

Fedorenko, E., Piantadosi, S. T., & Gibson, E. A. (2024). Language is primarily a tool for communication rather than thought. *Nature*, *630*(8017), 575-586.

Fitria, T. N. (2023). Teaching English for specific purposes (ESP): Teacher's role and their challenges. *Journal of English Education and Literacy*, *2*(1), 54–70. https://doi.org/10.33592/primacy.v2i1.3446

Fitriawati, N., & Herdiansah, A. (2019). Prototipe proses pembelajaran menggunakan ILearning pada STKIP Arramaniyah Tangerang. *Jurnal Informatika*, *3*(1), 44–50. https://doi.org/10.31000/jika.v3i1.2044

Gopal, R., et al. (2023). Measuring Malaysian lower secondary learners' reading ability on a CEFR-aligned text. *Studies in English Language and Education (SIELE)*, *10*(2), 614–627. https://doi.org/10.24815/siele.v10i2.28013

Hajar, M. N., et al. (2023). Self-evaluation of agro-industry prospective teacher's skill at vocational high school in information and communication technology literacy. *Journal of Education and Technology (Edutec), 6*(4), 651–659. https://doi.org/10.29062/edu.v6i4.680

Hamka, A. (2022). *Belajar bahasa Inggris dengan cara seru dan menyenangkan*. Kementerian Keuangan RI.

Hamzah, N., et al. (2021). Technical and vocational education students' perception of using learning videos during Covid-19 pandemic period. In *2021 IEEE International Conference on Automatic Control & Intelligent Systems (I2CACIS)*, Shah Alam, Malaysia, 346–351. https://doi.org/10.1109/12CASIS52118.2021.9495895

Haripriya, P., et al. (2021). Role of ICT tool in acquisition of proficiency in English language – A case study on outcome of using MePro Pearson software tool. *Turkish Journal of Computer and Mathematics Education (TURCOMAT), 12*(10), 2830–2837. https://turcomat.org/index.php/turkbilmat/article/view/4928

Hinojosa, D. M. (2022). Professional development program designed to support prospective teachers' enactment of instructional strategies to differentiate instruction for English learners. *The Teacher Educator, 58*(1), 49–71. https://doi.org/10.1080/08878730.2022.2088914

Hu, L. (2022). Visual analysis of English teaching model based on scientific programming. *Mobile Information Systems, 2022*(2), 1–12. https://doi.org/10.1155/2022/8592802

Indra, C. (2012). Pentingnya bahasa Inggris dan komputer. *Blogspot*. https://cahyoindra3.blogspot.com/2012/11/pentingnya-bahasa-inggris-dan-komputer.html

Jogiyanto, H. M. (2012). *Metode penelitian sistem informasi*. CV Andi Offset.

Johnson, F., et al. (2020). Analysis of student misconceptions using Python as an introductory programming language. In *CEP '20: Proceedings of the 4th Conference on Computing Education Practice*, 1–4. https://doi.org/10.1145/3372356.3372360

Jung, J., Shin, Y., & Zumbach, J. (2019). the effects of pre-training types on cognitive load, collaborative knowledge construction and deep learning in a computer-supported collaborative learning environment. *Interactive Learning Environments*, 29(7), 1163–1175. https://doi.org/10.1080/10494820.2019.1619592

Khudarova, A. et al. (2024). The Influence of the Cultural and Religious Factors on the Media. Journal of Ethnic and Cultural Studies. 11(3), 114-137. https://doi.org/10.29333/ejecs/1830

Komkob, A. A. et al. (2023). System for Digital Character Recognition, Extraction, and Structuring of Medical Data with the Formation of a Cloud-based Electronic Health Records. Cardiovascular Therapy and Prevention. 21(12), 3482. https://doi.org/10.15829/1728-8800-2022-3482

Koolen, Twan & Deits, R. (2019). Julia for robotics: simulation and real-time control in a high-level programming language. 2019 International Conference on Robotics and Automation (ICRA), Montreal, QC, Canada, pp.604-611. https://doi.org/10.1109/ICRA.2019.8793875

Kusumastuti, Adhi et al. (2020). Metode penelitian kuantitatif. Yogyakarta: Deepublish

Lakas, Abderrahmane & Belkacem, Abdelkader N. (2021). A framework for course-embedded assessment for evaluating learning outcomes of a network programming course. IEEE Global Engineering Education Conference (EDUCON), Vienna, Austria, pp. 989-995. https://doi.org/10.1109/EDUCON46332.2021.9454129

Lasheen, Ahmed D. (2022). Effectiveness of applying Webquest learning activities in developing mass communication students' ESP oral communication skills. JFEES. 46(3), 13-41 https://doi.org/10.21608/jfees.2022.262956

Lemeshchenko-Lagoda V., et al. (2020). Integration of information and communication technologies into the process of learning the course of English for specific purposes as one of the requirements for sustainable future development. E3S web conf. *International Conference on Sustainable Futures: Environment, Technological, Social and Economic Matters (ICSF).* Vol. 166, 1 - 9 https://doi.org/10.1051/e3sconf/202016610005

Lertchalermtipakoon, P., et al. (2021). Need analysis: English language use by students in the tourism and hospitality and industry. *The Canadian Center of Science and Education (CCSE)*. 14(3), 59 – 71. https://doi.org/10.5539/elt.v14n3p59

Li, Edmond, et al. (2021). Electronic health records, interoperability and patient safety in health systems of high-income countries: A systematic review protocol. PubMed. 11(7), 680-696 https://doi.org/10.1136/bmjopen-2020-044941

Lim, Raymond B. T. et al (2020). An integrative approach to needs assessment and curriculum development of the first public health major in singapore. *Front Public Health*. 8(182). https://doi.org/10.3389/fpubh.2020.00182

Lin, Yu-Tzu et al. (2022). Teaching programming by revealing thinking process: Watching experts' live coding videos with reflection annotations. *IEEE Transactions on Education.* 65(4), 617-627.

Lord, Courtney J. (2019). Designing an integrated education and training program for English language learners at a community-based literacy organization. MA TESOL Collection. 738, 1-79. https://digitalcollections.sit.edu/ipp_collection/738

Lubbers, Mart et al. (2019). Multitasking on microcontrollers using task oriented programming. *2nd international convention on information and communication technology, electronics and microelectronics (MIPRO) OPATIJA*, Croatia, pp. 1587-1592. https://doi.org/10.23919/MIPRO.2019.8756711

Masduqi, Harits, et al. (2023). Teaching Receptive and Productive Skills in an English Lesson Using Digital Learning Resources. Proceedings of the 4th International Conference Entitled Language, Literary, and Cultural Studies (ICON LATERALS). 1-16. http://dx.doi.org/10.4108/eai.11-7-2023.2340598

Mbunge, E. et al. (2021). *COVID-19 and online learning: factors influencing students' academic performance in first-year computer programming courses in higher education.* SSRN. Pp. 1-17 http://dx.doi.org/10.2139/ssrn.3757988

McCombes, S. (2019). *Correlational research*. Retrieved from: https://www.scribbr.com/methodology/correlational-research/7/

Muin, Abdul. (2015). Analisis kontrastif bahasa arab dan bahasa Indonesia. Jakarta: PT Pustaka Al Husna Baru

Mulyasa. (2012). Pendidikan anak usia dini. PT Remaja Rosdakarya

Mykytenko, Nataliya, et al. (2019). Teaching communication strategies to the computer programming students. *Advanced Education.* Issue 12, 49-54. https://doi.org/10.20535/2410-8286.167148

Nastiti, F.E, & Abdu, A. R. N. (2020). Kesiapan pendidikan Indonesia menghadapi era society 5.0. *Jurnal Kajian Teknologi Pendidikan.* 5(1), 61-66. https://doi.org/10.17977/um039v5i12020p061

Nugraha, I Made I. et al. (2024). Investigating EFL police officers' learning needs and problems in english listening and speaking skills: An English specific purposes (ESP) context. *Journal of Language and Literature Studies (JOLLS).* 4(1), 84–97. https://doi.org/10.36312/jolls.v4i1.1800

Pan, A. (2022). Construction and application of college English blended teaching system based on multimedia fusion. *Discrete Dynamics in Nature and Society*. Volume 2022, Issue 1. https://doi.org/10.1155/2022/4990844

Patel, Ayush et al. (2022). Chat application using server-side scripting, compression and end-to-end encryption. *Journal of Web Development and Web Design.* 7(2), 8-12 https://doi.org/10.46610/JoWDWD.2022.v07i02.003

Peacock, Jacksyn. (2020). How to Learn English. https://www.studiocambridge.co.uk/why-it-is-important-to-learn-english

Pelham, B, W., Carvallo, M., & Jones, J.T. (2005). Implicit egotism. *Current Directions in Psychological Science*, 14(2), 106 – 110. https://doi.org/10.1111/j.09637214.2005.00344.x

Polat, Elif & Yilmaz, Rabia M. (2022). Unplugged Versus Plugged-in: Examining Basic Programming Achievement and Computational Thinking of 6th-grade Students. Education and Information Technology. 27 (7), 9145–9179 https://doi.org/10.1007/s10639-022-10992-y

Poornesh, M. et al. (2021). Comprehensive strategy to inculcate professional skills among first year students: a collaborative learning approach. *Journal of Engineering Education Transformations*. 34(599), 599-606. https://doi.org/10.16920/jeet/2021/v34i0/157228

Prayudha, J. & Salihah, N. M. (2023). Integrating information communication technology in english language teaching. *The Journal of English Teaching for Young and Adult Learners*, 2(1), 29–35. https://doi.org/10.21137/jeeyal.2023.2.1.4

Queipo, E.A. B. et al. (2024). Comprehensive management for the process of access, retention, graduation, and employability in higher education. *Revista De Gestao Social E Ambiental (RGSA).* 18(9), 1-15 https://doi.org/10.24857/rgsa.v18n9-045

Rahmah, Adinda A. (2023). Evaluating of the importance of English as a foreign language in elementary schools in Indonesia. Journal of *Foreign Language Learning and Teaching (JoFLLT).* 3(1), 52-63. https://doi.org/10.23971/jfllt.v3i1.6894

Rajasekhar, N. (2022). Predicting academic achievement in programming for problem solving using supervised machine learning technique. *International Journal of Research Studies in Computer Science and Engineering (IJRSCSE).* 4(1), 46-51. http://dx.doi.org/10.20431/2349-4859.0401006

Rani, Aruna et al. (2024). NAMASTE Portal, data analysis, and understanding of Ayurveda medical record: An initial evaluation. *Journal of Research*

in Ayurvedic Sciences. 8(3), 119-129. https://doi.org/10.4103/jras.jras_241_23

Rasheed, M. M. et al. (2023). Developing an electronic health records system based on the national identity by using angular web application framework. *Applied Data Science and Analysis.* 2023(2023), 102-107. https://doi.org/10.58496/ADSA/2023/008

Retnowati, et al. (2024). Towards digital health transformation: the urgency of electronic student health reports (case study in SD Negeri Cipedak 03, South Jakarta and puskesmas Jagakarsa. *Jurnal BIKFOKES.* 4(1), 57-66. https://doi.org/10.51181/bikfokes.v4i1.7327

Rohimajaya, N. A., et al. (2021). Developing English materials for the students of information system department at technology and information faculty, Mathlaul Anwar University Banten. *Language Circle Journal of Language and Literature*. 15(2), 241-248. https://doi.org/10.15294/lc.v15i2.26275

Room, Marili et al. (2022). Learner success and the factors influencing it in computer programming MOOC. *Education and Information Technologies* 28 (2), 8645-8663. https://doi.org/10.1007/s10639-022-11535-1

Runge, Tobias et al. (2023). Flexible correct-by-construction programming. *Logical Methods in Computer Science.* 19(2), 1-36. https://doi.org/10.48550/arXiv.2211.15261

Saputra, A., et al. (2024). Development of electronic health record system for mobile-based medical service application in Pekanbaru military hospital. *Engineering and Technology Journal*, *9*(6), 4268–4275. https://doi.org/10.47191/etj/v9i06.13

Schleiff, M., et al. (2022). Defining and utilizing individualized learning objectives to achieve learning priorities for global health leaders. *PLOS ONE*, *17*(6), 1–11. https://doi.org/10.1371/journal.pone.0270465

Shah, C., Nachand, D., Wald, C., & Chen, P. H. (2023). Keeping patient data secure in the age of radiology artificial intelligence: cybersecurity considerations and future directions. *Journal of the American College of Radiology*, *20*(9), 828-835.

Shandra, N. (2021). Procedures for cooperative professionally oriented written communication of prospective programmers. *Journal IITTA*, *84*(4), 188–210. https://doi.org/10.33407/itlt.v84i4.4034

Siswanto, & Suyanto. (2018). *Metodologi penelitian kuantitatif korelasional*. Klaten: BOSSSCRIPT.

Sofia, S., et al. (2022). Analisis aspek keamanan informasi data pasien pada penerapan RME di fasilitas kesehatan. *Jurnal RAMMIK*, *1*(2), 94–103. https://doi.org/10.47134/rmik.v1i2.29

Spante, M., et al. (2019). MakerSpaces in schools: Networked learning among teachers to support curriculum-driven pupil learning in programming. In A. Littlejohn, J. Jaldemark, E. Vrieling-Teunter, & F. Nijland (Eds.), *Networked professional learning* (pp. 223–237). Springer. https://doi.org/10.1007/978-3-030-18030-0_13

Stanfill, M. H., & Marc, D. T. (2019). Health information management: Implications of artificial intelligence on healthcare data and information management. *PubMed*, *28*(1), 56–64. https://doi.org/10.1055/s-0039-1677913

Stein-Smith, K. (2019). Rethinking the role of languages in the US: Toward a more diverse cultural identity. *Journal of Language Teaching and Research*, *10*(3), 403–411. http://dx.doi.org/10.17507/jltr.1003.01

Sugeng, B. (2022). *Fundamental metodologi penelitian kuantitatif*. Yogyakarta: Deepublish.

Sugiyono, (2019). *Metode penelitian kuantitatif, kualitatif, dan R&D*. Bandung: Alphabet.

Supomo, N. B., et al. (2018). *Metodologi penelitian bisnis*. Yogyakarta: CV Andi Offset.

Susilawati, E. (2022). Online learning for freshmen: Opportunities and challenges in developing English communicative ability. *Journal of English Language Teaching Innovations and Materials (JELTIM)*, *4*(1), 32–53. https://doi.org/10.26418/jeltim.v4i1.50599

Sutrisno, T. A., & Kusumawati, E. A. (2022). *Dasar basis data dan MySQL dalam bidang rekam medis*. Dandelion Publisher.

Swapna, B., et al. (2023). *Bi-lingual programming: C and Python for modern coders*. Chennai: Jupiter Publication Consortium.

Syaifudin, Y. W., et al. (2023). An implementation of Android programming self-learning topic for developing online database application using Firebase. In *2023 Sixth International Conference on Vocational Education and Electrical Engineering (ICVEE)* (pp. 109–114). https://doi.org/10.1109/ICVEE59738.2023.10348259

Tamrat, T., et al. (2022). Digitalization of routine health information systems: Bangladesh, Indonesia, Pakistan. *PubMed*, *100*(10), 590–600. https://doi.org/10.2471/BLT.22.287816

Tarigan, H. G. (2013). *Menulis sebagai suatu keterampilan berbahasa*. CV Angkasa.

Thabroni, G. (2022). *Pemrograman dasar – konsep, logika, prinsip, dan langkah*. https://serupa.id/pemrograman-dasar-konsep-logika-prinsip-langkah

The English Language Center. (2013). Why is learning English so important? https://www.elc-schools.com/blog/4-reasons-why-learning-english-is-so-important/

Turnip, M., & Dharma, A. (2016). *Pemrograman dasar*. Deepublish.

Uehara, T., & Kojima, N. (2021). Prioritizing English-medium instruction teachers' needs for faculty development and institutional support: A best–worst scaling approach. *Education Sciences*, *11*(8), 1–17. https://doi.org/10.3390/educsci11080384

Veerasamy, A. K., & Shillabeer, A. (2014). Teaching English-based programming courses to English learners/non-native speakers of English. *International Proceedings of IACSIT*, 1–5. https://api.semanticscholar.org/CorpusID:19308285

Woodrow, L. (2017). *Introducing course design in English for specific purposes*. Routledge.

Xie, B., et al. (2019). A theory of instruction for introductory programming skills. *Computer Science Education*, *29*(2–3), 205–253. https://doi.org/10.1080/08993408.2019.1565235

Yalinda, Y. Y. (2018). *Pemrograman dasar*. Solo: Mediatama.

Yanti, S. N., & Nurhayati, M. (2023). Waterfall method of medical record application development using PHP and MySQL programming language. *Journal of Information System, Informatics and Computing (JISICOM)*, *7*(1), 15–25. https://doi.org/10.52362/jisicom.v7i1.1076

Yeng, P., et al. (2023). SecHealth: Enhancing EHR security in digital health transformation. In *Proceedings of the 8th International Conference on Sustainable Information Engineering and Technology* (pp. 538–544). https://dl.acm.org/doi/10.1145/3626641.3627214

Yuana, R. A. (2022). *Modul pemrograman terstruktur*. UNS Press.