

**LAPORAN AKHIR  
PENELITIAN SKEMA PENELITIAN PENGEMBANGAN**



**ENHANCING JAVASCRIPT LEARNING IN MOODLE LMS: A LIVE  
CODING PLATFORM WITH AUTOMATED EVALUATION USING  
OPENAI**

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Assoc. Prof. Dr. Rafikha Aliana binti A Raof

**UNIVERSITAS MUHAMMADIYAH YOGYAKARTA**

Dibiayai Oleh Direktorat Riset dan Pengabdian (DRP)  
Universitas Muhammadiyah Yogyakarta  
Tahun Anggaran 2024/2025



**UNIVERSITAS MUHAMMADIYAH YOGYAKARTA**  
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**PROTEKSI ISI LAPORAN AKHIR PENELITIAN**

Dilarang menyalin, menyimpan, memperbanyak sebagian atau seluruh isi laporan ini dalam bentuk apapun kecuali oleh peneliti dan pengelola administrasi penelitian.

**LAPORAN AKHIR PENELITIAN**

## **Informasi Data Usulan Penelitian**

### **1. IDENTITAS PENELITIAN**

#### **A. JUDUL PENELITIAN**

Enhancing JavaScript Learning in Moodle LMS: A Live Coding Platform with Automated Evaluation using OpenAI

#### **B. SKEMA, BIDANG, TEMA, DAN TOPIK PENELITIAN**

Skema Penelitian	Bidang Fokus Penelitian	Tema Penelitian	Topik Penelitian
Penelitian Pengembangan	Teknologi Informasi Dan Komunikasi	Pengembangan sistem berbasis Kecerdasan buatan	Pengembangan aplikasi sistem cerdas.

#### **C. KOLABORASI DAN RUMPUN ILMU PENELITIAN**

Jenis Kolaborasi Penelitian	Rumpun Ilmu 1	Rumpun Ilmu 2	Rumpun Ilmu 3
Kolaboratif Luar Negri	ILMU TEKNIK	TEKNIK ELEKTRO DAN INFORMATIKA	Teknologi Informasi

#### **D. WAKTU PELAKSANAAN**

Tahun Usulan	Tahun Pelaksanaan	Lama Penelitian
2024	2025	1

#### **E. ANCOR RESEARCH**

Anchor Research	Topik Anchor
Eko Purwanti, S.Pd., M.Hum., Ph.D.	Pendidikan yang Unggul dan Merdeka berbasis teknologi

#### **F. MATA KULIAH**

Penelitian	Mata kuliah
Pemenuhan IKS	TI-605 -- Pengembangan Web Service (S1 Teknologi Informasi)

#### **G. SUSTAINABLE DEVELOPMENT GOALS**

Tujuan	Target	Indikator
4. Pendidikan Bermutu	Target 4.4.	Pada tahun 2030, meningkatkan secara signifikan jumlah pemuda dan orang dewasa yang memiliki keterampilan yang relevan, termasuk keterampilan teknik dan kejuruan, untuk pekerjaan, pekerjaan yang layak dan kewirausahaan.
4. Pendidikan Bermutu	Target 4.6.	Pada tahun 2030, menjamin bahwa semua remaja dan proporsi kelompok dewasa tertentu, baik laki-laki maupun perempuan, memiliki kemampuan literasi dan numerasi.

Tujuan	Target	Indikator
8. Pekerjaan yang Layak dan Pertumbuhan Ekonomi	Target 8.6.	Pada tahun 2020, secara substansial mengurangi proporsi usia muda yang tidak bekerja, tidak menempuh pendidikan atau pelatihan

## H. DASAR AL QUR'AN

<b>Dasar Al Qur'an</b>	Al-'Asr
<b>Ayat Al Qur'an</b>	وَالْعَصْرُ أَنَّ الْأَنْسَانَ لَفِي خُسْرٍ إِلَّا الَّذِينَ آمَنُوا وَعَمِلُوا الصَّلِحَاتِ وَتَوَاصَوْا بِالْحَقِّ هُوَ تَوَاصُوا بِالصَّيْرَ
<b>Terjemahan Al Qur'an</b>	'Demi masa, sesungguhnya manusia benar-benar berada dalam kerugian, kecuali orang-orang yang beriman dan beramal saleh serta saling menasihati untuk kebenaran dan kesabaran.'
<b>Dasar Hadits</b>	Dari Ibnu Abbas radhiyallahu 'anhuma, Rasulullah ﷺ bersabda: "Manfaatkanlah lima perkara sebelum lima perkara: waktu mudamu sebelum datang waktu tuamu, waktu sehatmu sebelum datang waktu sakitmu, waktu kayamu sebelum datang waktu fakirmu, waktu luangmu sebelum datang waktu sibukmu, dan hidupmu sebelum datang matimu." (HR. Al-Hakim) Hadis ini menekankan pentingnya memanfaatkan waktu dan kesempatan dengan baik sebelum hal-hal yang tidak diinginkan datang. Hal ini sejalan dengan pesan Surat Al-Asr yang mengingatkan bahwa manusia berada dalam kerugian kecuali mereka yang beriman, beramal sholeh, dan bersabar dalam memanfaatkan waktu mereka untuk kebaikan. Dalam konteks riset Anda, AI-powered assessment membantu mahasiswa memanfaatkan waktu belajar dengan lebih efektif dan efisien, mendapatkan umpan balik langsung sehingga waktu mereka tidak terbuang sia-sia.
<b>Kata Kunci Penelitian</b>	Efisiensi Waktu
<b>Uraian Integrasi Keilmuan</b>	Judul riset "AI-Powered Automated Assessment for JavaScript Live Coding in Moodle LMS: An Integration of OpenAI API" berkaitan dengan Surat Al-Asr karena menekankan pentingnya memanfaatkan waktu secara efektif. Surat Al-Asr mengingatkan manusia untuk tidak berada dalam kerugian dengan memanfaatkan waktu untuk beriman, beramal sholeh, dan saling menasihati dalam kebenaran dan kesabaran. Platform yang dikembangkan dalam riset ini membantu mahasiswa belajar coding dengan lebih efisien melalui penilaiannya.

## 2. IDENTITAS PENELITIAN

Nama	Peran	Tugas
Dwijoko Purbohadi, Dr., S.T., MT.	Ketua Pengusul	
Haris Setyawan, S.T., M.Eng	Anggota Pengusul	Sosialisasi dan pelatihan produk software untuk dosen.
Shabit Hossain	Mahasiswa Bimbingan	Asisten saat eksperimen

## 3. MITRA KERJASAMA PENELITIAN

Pelaksanaan penelitian dapat melibatkan mitra kerjasama, yaitu mitra kerjasama dalam melaksanakan penelitian, mitra sebagai calon pengguna hasil penelitian, atau mitra investor

Mitra	Nama Mitra	Kepakaran	Jenis Mitra	Jenis Instansi	Alamat	Email	No Wa
Universitas Nahdlatul Ulama Yogyakarta	Lilis Kurnia Sari, ST. M.Kom	Data Science	Dalam Negeri	Perguruan Tinggi	Panjangrejo Pundong Bantul DI Yogyakarta	lilis@unu-jogja.ac.id	6281915452007

#### 4. KOLABORASI PENELITIAN

<b>Kolaborator 1</b>	
Nama	Adika Sri Widagdo, M.Kom
NiK/NIDN/NIK/ID/nomor Paspor	3310162308930001
Instansi	
Kepakaran	Data Science and AI
Dana In-cash	
Dana In-kind	Rp. 2,000,000
Keterangan In-kind	Biaya transport kegiatan rapat di UMY, pengambilan data, dan publikasi personal
Email	adika@umkla.ac.id
No. Hp	06287742204747
<b>Kolaborator 2</b>	
Nama	Dr. Nur Zareen Zulkarnain
NiK/NIDN/NIK/ID/nomor Paspor	A57481298
Instansi	Universiti Teknikal Malaysia Melaka
Kepakaran	NLP
Dana In-cash	
Dana In-kind	Rp. 1,000,000
Keterangan In-kind	Equivalent to consultation fees for writing scientific articles
Email	zareen@utem.edu.my
No. Hp	060124096951
<b>Kolaborator 3</b>	
Nama	Assoc. Prof. Dr. Rafikha Aliana binti A Raof
NiK/NIDN/NIK/ID/nomor Paspor	A58873328
Instansi	Universiti Teknikal Malaysia Melaka
Kepakaran	Image Processing
Dana In-cash	
Dana In-kind	Rp. 23,150,000
Keterangan In-kind	Participation in international seminar
Email	eafikha@unimap.edu.my
No. Hp	60194122030

#### 5. LUARAN DAN TARGET CAPAIAN

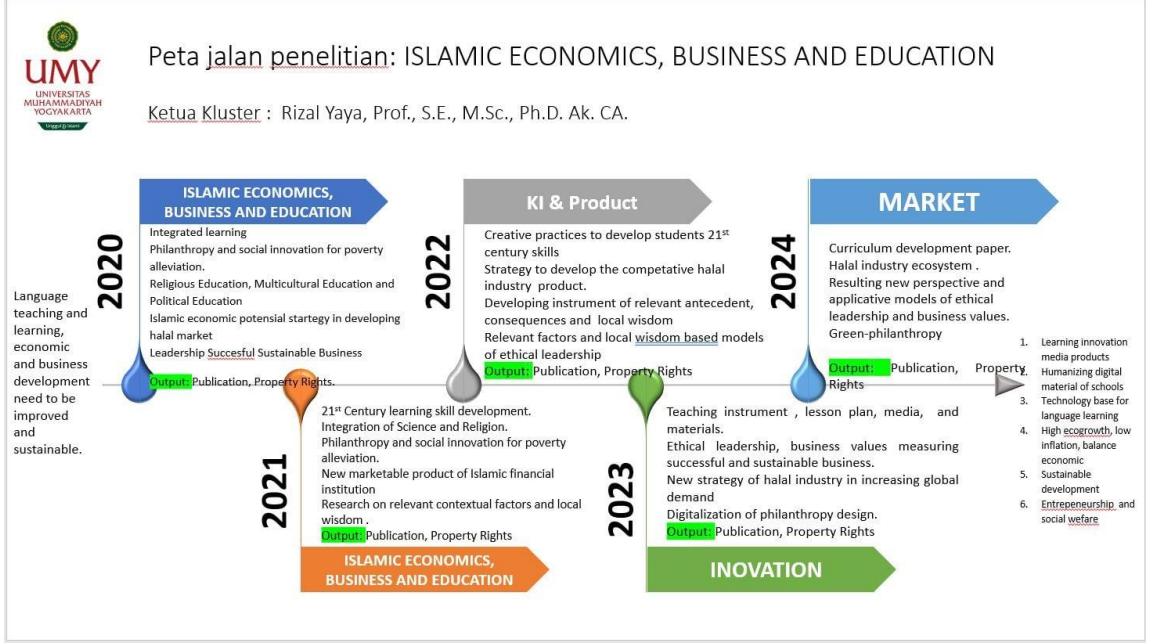
Luaran Wajib

Tahun	Jenis Luaran
1	Proceeding terindeks SCOPUS.
1	Business Plan

## Luaran Tambahan

Tahun	Jenis Luaran
1	Buku Ajar

## 6. KLUSTER

Kluster	Sub Kluster	Roadmap Riset	Mata kuliah
ISLAMIC ECONOMICS, BUSINESS AND EDUCATION	ISLAMIC INNOVATIVE EDUCATION	CREATIVE TEACHING AND LEARNING	TI-605 -- Pengembangan Web Service
Kluster			
 <p>Peta jalan penelitian: ISLAMIC ECONOMICS, BUSINESS AND EDUCATION</p> <p>Ketua Kluster : Rizal Yaya, Prof., S.E., M.Sc., Ph.D. Ak. CA.</p>  <pre> graph LR     subgraph 2020 [ ]         direction TB         A[ISLAMIC ECONOMICS, BUSINESS AND EDUCATION] --&gt; B[KI &amp; Product]         B --&gt; C[MARKET]     end     subgraph 2021 [ ]         direction TB         D[ISLAMIC ECONOMICS, BUSINESS AND EDUCATION] --&gt; E[KI &amp; Product]         E --&gt; F[MARKET]     end     subgraph 2022 [ ]         direction TB         G[ISLAMIC ECONOMICS, BUSINESS AND EDUCATION] --&gt; H[KI &amp; Product]         H --&gt; I[MARKET]     end     subgraph 2023 [ ]         direction TB         J[ISLAMIC ECONOMICS, BUSINESS AND EDUCATION] --&gt; K[KI &amp; Product]         K --&gt; L[MARKET]     end     subgraph 2024 [ ]         direction TB         M[ISLAMIC ECONOMICS, BUSINESS AND EDUCATION] --&gt; N[KI &amp; Product]         N --&gt; O[MARKET]     end     P[INNOVATION] --- Q[Output: Publication, Property Rights]     </pre> <p>2020: Language teaching and learning, economic and business development need to be improved and sustainable.</p> <p>2021: 21<sup>st</sup> Century learning skill development. Integration of Science and Religion. Philanthropy and social innovation for poverty alleviation. New marketable product of Islamic financial institution. Research on relevant contextual factors and local wisdom. Output: Publication, Property Rights.</p> <p>2022: Integrated learning. Philanthropy and social innovation for poverty alleviation. Religious Education, Multicultural Education and Political Education. Islamic economic potential strategy in developing halal market. Leadership Successful Sustainable Business. Output: Publication, Property Rights.</p> <p>2023: Creative practices to develop students 21<sup>st</sup> century skills. Strategy to develop the competitive halal industry product. Developing instrument of relevant antecedent, consequences and local wisdom. Relevant factors and local wisdom based models of ethical leadership. Output: Publication, Property Rights.</p> <p>2024: Curriculum development paper. Halal industry ecosystem . Resulting new perspective and applicative models of ethical leadership and business values. Green-philanthropy. Output: Publication, Property Rights.</p> <p>INNOVATION: 1. Learning innovation media products. Humanizing digital material of schools. 3. Technology base for language learning. 4. High ecogrowth, low inflation, balance economic. 5. Sustainable development. 6. Entrepreneurship and social welfare.</p>			

## Sub Kluster



### Peta jalan penelitian: Sub Kluster Islamic Innovative Education

Koordinator: Eko Purwanti, Ph.D.

2020-2021

#### R & D/Riset Dasar

##### Research Focus:

- Exploring creative foreign language teaching and learning
- The importance of FL curriculum based on MBKM and other relevant approach.
- Exploring digitation in Islamic counselling approach
- Exploring foreign language use and standardized FL proficiency
- Investigating university policy about TPD

The needs to develop qualified education focusing on creative and innovative foreign language curriculum and teaching based on Industrial Revolution 4.0 and Society 5.0 as well as Islamic approach to enhance qualified educators and graduate employability.

2022

2023

#### Riset Dasar Lapangan

##### Research Focus:

- Developing the model of creative foreign language teaching and learning
- Developing the model of FL curriculum based on MBKM and other relevant approach.
- Developing the model of technology use in Islamic counseling
- Mapping types of foreign language use and standardized FL proficiency
- Building teacher professionalism through Catur Dharma Perguruan Tinggi.

#### Riset Terapan

##### Research Focus:

- Advanced model for teaching and learning
- Standardized FL curriculum to enhance graduate employability
- Advanced model of Islamic counseling
- Standardized model to assess students' FL proficiency
- Professional Learning Community as a model of sustaining teaching excellence in higher education.

2025

2024

##### Research Focus:

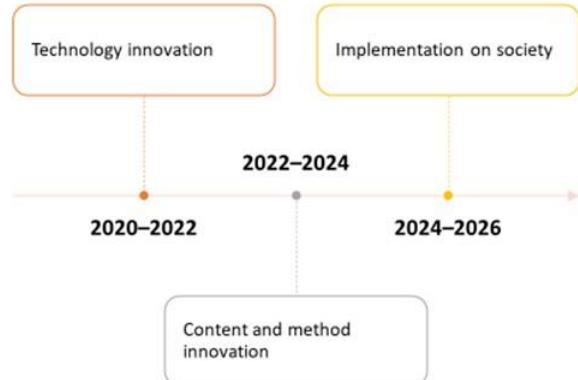
- Applying the model of creative foreign language teaching and learning
- Applying the model of FL curriculum based on MBKM and other relevant approach.
- Applying the model of technology use in Islamic counseling
- Applying standardized FL proficiency to assess students' performance.
- Developing systemic model of TPD in higher educations.

Excellent education in Foreign Language curriculum and teaching based on Industrial Revolution 4.0 and Society 5. to enhance graduate employability and students' wellbeing.

## Roadmap Riset

### e-learning (research roadmap)

Dr. Dwijoko Purbohadi



## 7. ANGGARAN

Rencana anggaran biaya penelitian mengacu pada PMK yang berlaku dengan besaran minimum dan maksimum sebagaimana diatur pada buku Panduan Penelitian dan Pengabdian kepada Masyarakat.

Total Keseluruhan RAB Rp. 32,000,000

Total Dana Cash Rp. 0

Total Dana Inkind Rp. 26,150,000

Tahun 1 Total Rp. 32,000,000

Jenis Pembelanjaan	Komponen	Item	Satuan	Vol.	Harga Satuan	Total
BAHAN	Hibah Alat/Barang	OpenAI JavaScript Live Coding (1-6) software, testing include	Unit	5	Rp. 2,000,000	Rp. 10,000,000
ANALISIS DATA	Biaya Konsumsi Rapat	Makan, minum, snack rapat kegiatan	OH	25	Rp. 60,000	Rp. 1,500,000
BAHAN	Bahan (Habis Pakai)	Paket Server Co-Location 1 Tahun	Unit	1	Rp. 7,454,000	Rp. 7,454,000
BAHAN	Bahan (Habis Pakai)	Paket OpenAI API Pro	Unit	3	Rp. 3,267,000	Rp. 9,801,000
PELAPORAN, LUARAN WAJIB, DAN LUARAN TAMBAHAN	Biaya Luaran KI (Paten, Hak Cipta , dll)	Mengurus HaKI	Paket	1	Rp. 745,000	Rp. 745,000
ANALISIS DATA	Honorarium Analisis Data	Analisis data	OK(Kali)	1	Rp. 1,250,000	Rp. 1,250,000
ANALISIS DATA	Honorarium Pengolah Data	Pengumpulan dan pengolahan data	Per Penelitian	1	Rp. 1,250,000	Rp. 1,250,000

## 8. LEMBAR PENGESAHAN

### HALAMAN PENGESAHAN LAPORAN AKHIR PENELITIAN SKEMA:

Judul : Enhancing JavaScript Learning in Moodle LMS: A Live Coding Platform with Automated Evaluation using OpenAI  
Peneliti/Pelaksana : Dwijoko Purbohadi, Dr., S.T., MT.  
NIDN : 0502026801  
Jabatan Fungsional : Lektor Kepala  
Program Studi/Fakultas : Teknologi Informasi  
Nomor HP : 08179438668  
Alamat surel (e-mail) : dwijoko.purbohadi@umy.ac.id

#### Anggota

Nama : Haris Setyawan, S.T., M.Eng  
NIDN : 0511116901  
Jabatan Fungsional : Lektor  
Program Studi/Fakultas : Teknologi Informasi

Nama : Shabit Hossain  
NIM : 20220140207

Prodi : S1 Teknologi Informasi  
 Mitra : Universitas Nahdlatul Ulama Yogyakarta  
 Nama Mitra : Lilis Kurnia Sari, ST. M.Kom  
 Kepakaran : Data Science  
 Nama : Assoc. Prof. Dr. Rafikha Aliana binti A Raof  
 NIK : A58873328  
 Institusi : Universiti Teknikal Malaysia Melaka  
 Biaya : Rp. 32,000,000  
 Biaya Dana Cash : Rp. 0  
 Biaya Dana Inkind : Rp. 26,150,000

Yogyakarta, 31 Juli 2025  
 Mengetahui,  
 Direktur Direktorat Riset dan Pengabdian,  

Signature

apt. RR. Sabtanti Harimurti, M.Sc, Ph.D.  
 NIK. 19730223201310 173 127

## 9. RESEARCH SUMMARY

It is necessary to develop this automatic correction system to aid lecturers in coping with the weight of heavy job correction, particularly in classes that involve programming. Within the Information Technology Study Program at the University of Muhammadiyah Yogyakarta, students can learn programming using the medium of multimedia courses. This course focuses on teaching creative programming using the p5.js JavaScript library, which requires students to create various projects and assignments. With 16 meetings, students are given ten programming assignments throughout the semester. Considering that the number of students who take this course reaches 60 people every semester, lecturers have to correct around 600 codes every semester. This condition poses a big challenge for lecturers in providing fast and quality feedback, thus hindering the ideal teaching-learning process.

The main goal of this research is to develop an auto-correction system integrated into the live coding platform in Moodle LMS, which utilizes Open-AI technology to evaluate the code submitted by students automatically. This system is designed to minimize the time required for lecturers to correct assignments while improving the quality and speed of student feedback. With direct feedback, students can immediately identify their syntax, logic, and code efficiency mistakes so that they can learn faster and more effectively.

The stages in this research method involve several main steps. First, the development of a live coding platform that is integrated with Moodle LMS, where students can directly write and execute JavaScript code p5.js. After that, the system will use the OpenAI API to evaluate the code submitted by students based on specified criteria, such as syntax correctness, logic, and program efficiency. The testing phase will involve 60 participants. The students will submit their assignments to LMS and will evaluate by this system. The data collected during the test included the level of student engagement, the time to complete the assignment, and the effectiveness and accuracy of the feedback from the system. Based on this data, the system's performance is evaluated to improve its function before it is implemented more widely.

The targeted output of this study is an auto-correction system that can be integrated into Moodle LMS, especially for JavaScript-based programming courses. With this system, students can receive fast and quality feedback. The lecturers can reduce their workload regarding corrections. In addition, additional outputs in the form of scientific publications that discuss the effectiveness of this system in improving the quality of programming learning are expected to be published in accredited journals. The implementation of this system also has the potential to be further developed into other programming courses.

The RTL expected from the results of this research is to reach level 6. At this level, the system prototype has been tested in a relevant environment involving students and lecturers. It is ready to be implemented more widely in various study programs that use Moodle LMS. The results of this study could provide crucial answers to problems that might come up when we teach programming subject. Not just at Yogyakarta's Muhammadiyah University but also at other academic establishments. Due to the integration of artificial intelligence technology, this system also helps to further the development of technology-based learning approaches in the future.

## 10. KEYWORDS

Auto-correction system, Live coding, OpenAI technology, Programming education, Moodle LMS

## 11. RESEARCH RESULT

The first stage of the research is to develop a live coding platform which integrated with Moodle LMS. Using this software, students can write and run JavaScript code that uses the p5.js library. The main goal of developing this platform is to make it easier for students to do live coding, test, and report their work. The system automatically saves student code while evaluating and scoring it. The evaluation uses several essential criteria, such as syntactic correctness, program logic, and code efficiency. OpenAI API will analyse the program code and provide feedback automatically. Figure 1 shows the live coding software architecture. We implement the software architecture in Shareable Object Reference Model (SCORM). The advantage of SCORM as LMS content are simple, interactive, and web support (Purbohadi, n.d., 2022).

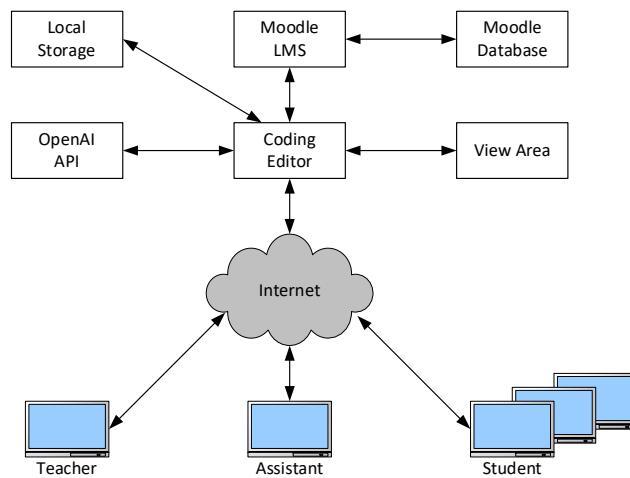


Figure 1. Live Coding Architecture

The second stage is testing the system through an experiment. We will involve information technology students who take the Multimedia course. Students will submit their assignments through Moodle LMS. In addition to the evaluation results and scores, we collect data on task completion time, student engagement levels, system accuracy, and student responses. Figure 2 shows the research method.

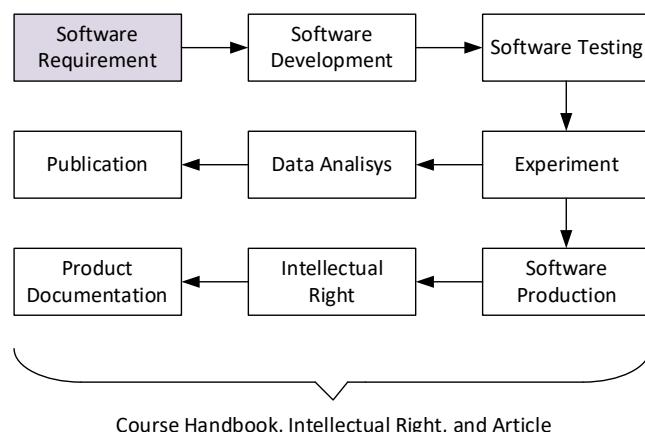


Figure 2. Research method

In this study, we will measure the student satisfaction and activity level base on the feedback quality. We measured student satisfaction by evaluating students' perceptions of several essential aspects, such as ease of use, speed of feedback, and the impact of feedback on their learning. We used a Likert-type questionnaire to measure this satisfaction. We will ask the students to rate their experience in these aspects.

In addition, we measured student activity levels by collecting data on the frequency of students logging in, the length of sessions they spent, and the frequency of revisions made after receiving feedback. We tracked these activities using LMS data, such as the number of click and the time spent in each session. Assignment revisions after feedback were also a key indicator for measuring student activity levels.

By measuring these two variables, we aimed to assess how much a technology-based learning system can increase student engagement and provide an adequate learning experience. Data on student satisfaction provide insight into the strengths and weaknesses of the system. In contrast, data on student activity level indicate the extent to which students are actively involved in the learning process and use feedback to improve the quality of their assignments. Analysis of these two variables is expected to provide a clearer picture of the effectiveness of the learning system.

The last stage is evaluating the system's performance carefully. This evaluation aims to conclude the overall functionality of the system.

### Summary of research progress

No	Activity	Status
1	Software requirement analysis	Done
2	Software development	Done
3	Software testing	Done
4	Experiment	Done
5	Data analysis and publication	Done
6	Software production	Done
7	Proposed intellectual property rights	Done
8	Product documentation	Done

### Modul/Software interface

The screenshot shows a software interface for developing web applications. On the left, there is a code editor titled "HTML - CSS - JavaScript" containing the following code:

```
1 <!DOCTYPE html>
2 <html>
3   <head>
4     <title>Hello</title>
5   </head>
6   <body>
7     <div align='center'>
8       <h1>Test 123</h1>
9     </div>
10    <hr>
11    <script>
12      console.log('console log')
13    </script>
14  </body>
15 </html>
```

At the bottom of the code editor, there is a small green box with the text "console log". To the right of the code editor, there is a preview window titled "Test 123" showing the rendered HTML page. The preview window contains the following content:

Test 123

Test 123

console log

The preview window has a blue circular icon at the bottom center. In the top right corner of the preview window, there is a small watermark or logo that says "USCI".

**HTML - CSS - JavaScript**

**TUTORIAL**

**HTML (HyperText Markup Language):** Bahasa standar untuk membuat struktur dasar halaman web. HTML digunakan untuk menyusun elemen-elemen seperti teks, gambar, tautan, dan form.

- [HTML Tutorial Point](#)

**CSS (Cascading Style Sheets):** Bahasa yang digunakan untuk mengatur tampilan dan tata letak elemen HTML. CSS memungkinkan berguna untuk mengubah warna, font, ukuran, spasi, dan responsivitas halaman.

- [CSS Tutorial Point](#)

**JavaScript:** Bahasa pemrograman yang digunakan untuk menambahkan interaktivitas ke halaman web. JavaScript memungkinkan pembuatan fitur seperti tombol interaktif, validasi form, animasi, komunikasi dengan server, dan lain sebagainya tanpa memuat ulang halaman.

- [Tutorial Point](#)
- [JavaScript Tutorial](#)

**Saran Perbaikan**

**Evaluasi:**

1. Buatlah input tag untuk memasukkan dua angka yang akan dijumlahkan.
2. Tambahkan script JavaScript untuk mengambil nilai dari input tag, menjumlahkannya, dan menampilkan hasilnya di bawah input tag.
3. Sesuaikan judul dan konten halaman dengan tugas yang diberikan.

Berikut contoh perbaikan kode untuk membuat kalkulator sederhana:

```
<!DOCTYPE html>
<html>
<head>
<title>Kalkulator Penjumlahan</title>
</head>
<body>
<div align="center">
<h1>Kalkulator Penjumlahan</h1>
<input type="number" id="num1" placeholder="Masukkan angka pertama">
<input type="number" id="num2" placeholder="Masukkan angka kedua">
<button onclick="hitung()>Hitung</button>
<p id="result"></p>
</div>
<br>

<script>
function hitung() {
var num1 = parseInt(document.getElementById("num1").value);
var num2 = parseInt(document.getElementById("num2").value);
var result = num1 + num2;
document.getElementById("result").innerHTML = result;
}
</script>
```

**HTML - CSS - JavaScript**

**TUTORIAL**

**HTML (HyperText Markup Language):** Bahasa standar untuk membuat struktur dasar halaman web. HTML digunakan untuk menyusun elemen-elemen seperti teks, gambar, tautan, dan form.

- [HTML Tutorial Point](#)

**CSS (Cascading Style Sheets):** Bahasa yang digunakan untuk mengatur tampilan dan tata letak elemen HTML. CSS memungkinkan berguna untuk mengubah warna, font, ukuran, spasi, dan responsivitas halaman.

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**JavaScript:** Bahasa pemrograman yang digunakan untuk menambahkan interaktivitas ke halaman web. JavaScript memungkinkan pembuatan fitur seperti tombol interaktif, validasi form, animasi, komunikasi dengan server, dan lain sebagainya tanpa memuat ulang halaman.

- [Tutorial Point](#)
- [JavaScript Tutorial](#)

**Test 123**

## 12. RESEARCH OUTPUT

There are three research output:

No	Output	Progress	Note
1	Scopus-indexed	Submitted	
2	Business plan	50%	

		Submitted to LRI	Title:  <i>Creative Coding untuk Pengembangan E-Learning Interaktif</i>  Intisari software yang dikembangkan dalam penelitian adalah pemrograman creative, yaitu memanfaatkan kemampuan SCORM Standar dan Creative Coding Library. Kombinasi ini untuk membentuk Programming Editor yang dirancang khusus untuk pemrograman berbasis JavaScript.
3	Textbook		

## 12. KESIMPULAN PENELITIAN

This study presents a new teaching approach to web-based IoT programming with live coding, remote device access, and AI-based testing in an LMS. The findings of the observed impacts indicate that this approach significantly improves students' learning performance and motivation.

Use of artificial intelligence to comment code facilitates self-learning and lessens dependency on explicit instructor interaction, whereas the use of actual Internet of Things devices contributes to the realism of the learning environment. The interview results provide qualitative insight by validating that students like this method not just because it is efficient but also because it is inspiring.

Overall, the approach is a promising direction for technology-enhanced programming pedagogy. Future studies will expand the system, enhance the AI mechanisms for feedback, and examine long-term impact on learning trajectories.

## 13. STATUS LUARAN WAJIB

Jurnal Q3 which has a scope according to the title and content of the draft. Proof of draft paper and proof of submission are attached.

## 14. DOKUMEN LUARAN WAJIB

Sudah di upload di SimLitabMas UMY.

## 15. LINK LUARAN TAMBAHAN

Tidak ada luaran tambahan

## 16. PARTNER ROLE

This research involves both local and international partners. The local partners assist with the experiments, including collecting research data. The international partners contribute to the publication process.

## 17. DAFTAR PUSTAKA

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## **18. APPENDIX**

### **Research Instrument**

#### **Student Satisfaction Questionnaire**

##### Instructions

Please rate each of the following statements based on your experience using the learning system. Choose the number that best represents your opinion, with a scale from 1 to 5:

1 = Strongly Disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly Agree

1. The learning system is easy to use.  
 1  2  3  4  5
  
2. The system provides quick feedback after submitting tasks.  
 1  2  3  4  5
  
3. The quality of feedback provided by the system on my submitted tasks is helpful and clear.  
 1  2  3  4  5
  
4. The system helps me understand the learning material better.  
 1  2  3  4  5
  
5. Receiving automated feedback from the system motivates me to improve my learning.  
 1  2  3  4  5
  
6. Overall, I am satisfied with using this system for my learning.  
 1  2  3  4  5

#### **Student Activity Level Questionnaire**

##### Instructions

Please answer the following questions based on your level of involvement with the learning system.

1. How often do you access the learning system in a week?  
 Every day

- 3-4 times a week
  - 1-2 times a week
  - Never
2. On average, how much time do you spend using the system each time?
- Less than 30 minutes
  - 30-60 minutes
  - 1-2 hours
  - More than 2 hours
3. How often do you revise your tasks after receiving automated feedback from the system?
- Always
  - Frequently
  - Occasionally
  - Never
4. Does receiving feedback from the system motivate you to complete tasks better?
- Strongly motivated
  - Moderately motivated
  - Slightly motivated
  - Not motivated at all
5. Do you feel that your activity in the system helps you achieve your learning objectives?
- Strongly helps
  - Moderately helps
  - Slightly helps
  - Does not help at all