

## From Text to Visual Story: Enhancing STEM Students' English Writing

Makoto Shishido, Tokyo Denki University, Japan

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### Abstract

This paper reports on a classroom study that introduced Adobe Express and its generative AI engine, Firefly, into an English as a foreign language class for STEM students in Japan. Many STEM learners encounter difficulties in writing, not only because of limited vocabulary but also due to hesitation in expressing personal ideas and little experience with creative communication. To respond to these challenges, I implemented a project-based instructional model combining writing with visual design. Students followed four steps: (1) composing a short essay, (2) revising tone and clarity with support from AI tools, (3) generating images that reflected their text, and (4) creating slides or posters using Adobe Express. By combining words and visuals, students were able to engage in more meaningful self-expression. Their written work demonstrated stronger narrative structure and improved audience awareness. Survey feedback indicated that AI-supported visual storytelling increased motivation and made revision feel more purposeful. While some students required initial guidance in using the tools, most adapted quickly and appreciated the multimodal format. The results suggest that generative AI, when used thoughtfully, can act as a supportive partner rather than a substitute. Adobe Firefly and Express encouraged students to rethink how text and images interact to convey meaning, helping them to move away from rigid prose toward more creative and communicative writing. These findings highlight the pedagogical potential of generative AI for supporting expression, creativity, and engagement among STEM learners.

*Keywords:* generative AI, AI-assisted writing, multimodal composition, project-based learning, STEM EFL learners

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## Introduction

In today's global and digitally connected world, English proficiency has become an essential skill for STEM students. While their technical fields demand logical precision, many of these students have little experience with expressive and creative communication. As a result, they may write essays that are grammatically correct but lack fluency, flow, or a personal voice. In Japan, traditional English writing instruction has frequently placed a strong emphasis on accuracy and structure, leaving limited space for students to experiment with ideas or narrative style. This gap creates a real challenge: learners may possess strong technical knowledge but still struggle to convey their ideas effectively to a broader audience.

Generative AI tools such as Adobe Firefly and Adobe Express offer new ways to address this challenge. By combining text and visual elements, they allow students to transform abstract concepts into more engaging forms of communication. These tools can lower the barrier to creative expression, making the writing process feel less intimidating and more interactive. For instance, Firefly's text-to-image feature enables students to visualize their ideas, while Express provides accessible design functions that help them build professional-looking posters or slides.

As an instructor, I was interested in whether integrating these tools into writing assignments could help STEM students improve both confidence and creativity. Could they learn to view English not just as a technical requirement but also as a medium for storytelling and expression? This paper describes how I incorporated Firefly and Express into an English course and examines their effects on student writing, motivation, and engagement.

## Theoretical Framework

The design of this project was informed by several well-established educational theories and frameworks. Each of them highlights a different dimension of how students learn, and together they provide the rationale for bringing generative AI into writing instruction.

First, constructivism (Papert, 1980) emphasizes that learners build knowledge most effectively when they actively create and shape their own learning materials. This principle guided the idea of having students generate not only text but also images and slides.

Second, Kolb's Experiential Learning Cycle (1984) stresses the importance of learning through action, reflection, and application. The four-step process used in this study—writing, revising, visualizing, and presenting—closely mirrors this cycle.

Third, Multimedia Learning Theory (Fiorella & Mayer, 2015) suggests that combining words with visuals can lead to deeper understanding and better retention. Asking students to generate images with Firefly was one way to put this principle into practice.

Fourth, Bloom's Taxonomy (Anderson & Krathwohl, 2001) provides a framework for moving from lower-order thinking skills, such as remembering and understanding, toward higher-order skills like analysis and creation. The project encouraged students to progress along this continuum by revising and redesigning their work.

Finally, the UNESCO Digital Literacy Framework (2018) underscores the importance of creativity, problem-solving, communication, and adaptability—skills that extend beyond the

classroom into students' future careers. Integrating generative AI was one way to align English writing instruction with these 21st-century competencies.

Taken together, these perspectives justify the use of multimodal, AI-enhanced writing tasks that ask students not only to compose text but also to experiment, reflect, and communicate in richer, more creative ways.

## **Methodology**

### **Participants**

The study was conducted with undergraduate STEM majors enrolled in an English language course at Tokyo Denki University. The participants represented a range of English proficiency levels, from false-beginners to lower-intermediate, and the majority had little or no prior experience using generative AI tools. This diversity allowed us to observe how students with different language backgrounds adapted to the integration of Firefly and Express in their writing tasks.

### **Procedure**

To explore how generative AI could support creative writing, I designed a Four-Step Creative Learning Model that was implemented over the course of one semester.

### **Essay Writing**

Students began by writing short essays on familiar and personally meaningful topics. Examples included dream trips, global cities, aspects of cultural heritage, and contemporary themes such as Society 5.0. The aim was to encourage authentic expression while keeping the topics accessible.

### **Tone Refinement With AI**

After completing their drafts, students used AI tools—Adobe Firefly, Adobe Express, and ELST—to revise tone, improve clarity, and address grammatical issues. The process was not about producing a “perfect” text but about helping students notice alternatives and refine their ideas.

### **Image Generation**

Next, students created visual representations of their essays using Firefly's text-to-image prompts. For example, one student who wrote about Paris generated an image of the Eiffel Tower illuminated at night, which complemented the narrative in the essay.

### **Slide/Poster Creation**

Finally, students combined their written work and AI-generated visuals into slides or posters using Adobe Express. The tool's simple design features enabled them to produce structured, visually appealing presentations that could effectively communicate their ideas to an audience. This cycle not only mirrored Kolb's experiential learning model but also encouraged students to move iteratively between writing, reflection, and creative redesign.

## Data Collection

To capture a full picture of student learning and engagement, data were gathered from several sources. First, student essays were collected in both their original and revised forms. This allowed for a direct comparison of how tone, structure, and clarity changed after students used the AI tools. In addition, the images generated with Adobe Firefly were reviewed to see how students translated their written ideas into visual form and how these visuals complemented the narratives.

The final products—slides and posters created in Adobe Express—were also analyzed, focusing on how effectively students integrated text and visuals into coherent multimodal presentations. Alongside these artifacts, a post-course survey (including Likert-scale and open-ended items) provided insights into students' perceptions of the process. Finally, my classroom observations served as an additional layer of data, offering context about how students engaged with the tools during lessons.

During the review, I also noticed that a small number of essays showed signs of being far beyond the writer's usual ability. In one case, vocabulary range and syntactic complexity were inconsistent with the student's previous work, raising the possibility of unacknowledged AI assistance. Such instances underline the importance of setting clear guidelines for the ethical use of generative AI in academic writing, as well as incorporating in-class writing activities to ensure authenticity.

It is worth noting that the essay shown in Figure 1 appears to exceed the typical writing proficiency of the student who submitted it. The vocabulary range, sentence structure, and overall style are noticeably different from the student's earlier work and from the general level of the class. This discrepancy suggests that the text may have been generated—or at least heavily influenced—by an AI tool, without clear acknowledgment.

Such cases underline the importance of establishing transparent guidelines for the ethical use of generative AI in academic settings. They also highlight the need to design tasks and in-class writing activities that allow instructors to better confirm the authenticity of student work, while still encouraging students to explore the benefits of new technologies responsibly.

### Figure 1

#### *Example Student Essay 1*

I would like to go to Italy to visit tasteful and beautiful architecture. Italy is a country of beauty and affluence where history, culture, gastronomy, and nature are united. For example, popular Italian foods such as pizza, pasta, risotto, cheese, wine and raw ham can be eaten everywhere. The Vatican Museum of Art in Vatican City, the world's smallest independent country, offers a view of some of the world's best works of art, including the works of Leonardo da Vinci, Michelangelo and Raphaelo, the three greatest Renaissance masters. In addition, we can see various architectures from ancient Rome to modern times, including Milan Cathedral in Milan, San Marco Temple in Venice, and Colosseum and Pantheon Temple in Rome. And I thought about the itinerary where I could visit tasteful and beautiful architecture in Italy. On the first day, I am thinking of visiting Venice. I would like to see the magnificent Gothic Ducal Palace. And I would like to ride a gondola, a traditional rowing boat, and see the beautiful streets. On the second day, I will visit Rome, a treasure trove of world heritage. There, I would like to go to the Colosseum, a circular stadium built in ancient Rome, the Pantheon Temple, which features a front entrance consisting of eight huge pillars, and Spain Square, which has steps

designed like waves. And I love Italian food, so I would like to eat pizza and pasta to my heart's content.

Figures 2, 3, and 4 show examples of student essays that were written independently but highlight some of the common challenges faced by learners. The writing tends to rely on short and simple sentences, vocabulary is limited, and grammatical errors appear frequently. Overall, the texts do not fully meet the expectations for the assignment in terms of linguistic accuracy or communicative depth.

### **Figure 2**

#### *Example Student Essay 2*

I want to go to the UAE. I especially want to go to Dubai and Abu Dhabi. The Burj Khalifa is located in Dubai. The Burj Khalifa is the tallest tower in the world. I would like to see the view of Dubai from the observatory. In Abu Dhabi, I would like to visit Ferrari World. This is a roller coaster in the shape of an F1 car.

### **Figure 3**

#### *Example Student Essay 3*

My first trip will be Dubai. I will visit the Burj Khalifa. I will enjoy the view from the top of the world's tallest building. After , I will shopping Dubai Mall, and exploring the famous Dubai Aquarium. I want to buy a souveir there. I will enjoy a watar performance at the Dubai Fountain at night.

### **Figure 4**

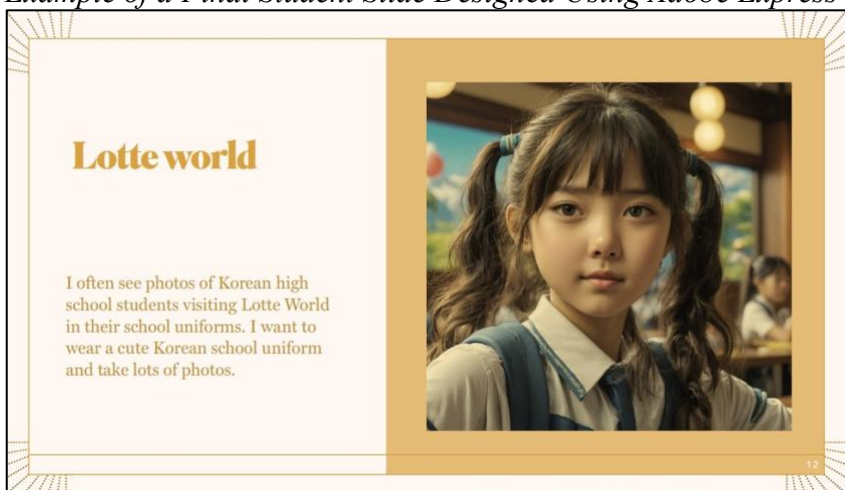
#### *Example Student Essay 4*

I'd like to go to Cairo. Especially, I'd like to go to Amr Ibn al-As Mosque because it is so seminary, Arabian Coast in Tokyo Disney Sea. I like its mood. It is beautiful at all times, but especially beautiful at night.

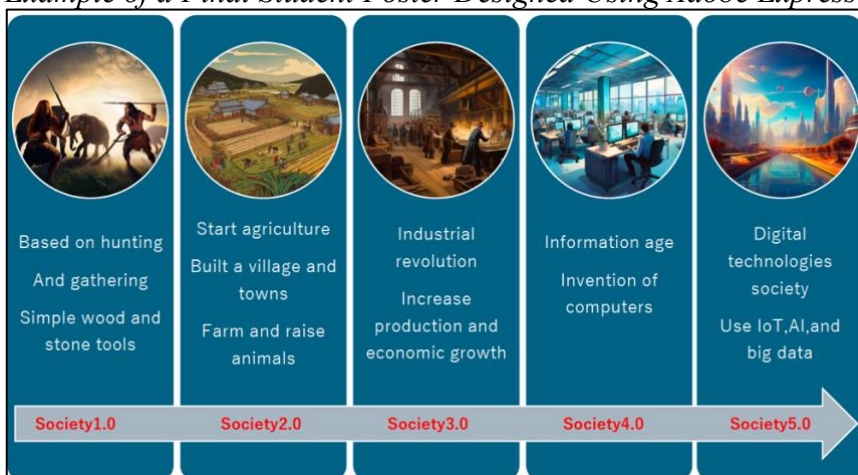
To address these issues, the course design incorporated creative writing activities that combined student-produced text with AI-generated visuals. This multimodal approach aimed to spark richer vocabulary use, encourage more detailed descriptions, and support greater engagement with the writing process by allowing students to visualize and expand their ideas.

As seen in Figures 1 through 4, some essays suggested the possibility of AI-assisted plagiarism, while others clearly reflected students' limited English proficiency. However, when students were encouraged to pair their writing with images, the results showed a marked improvement in both content and presentation. The contrast becomes especially evident in later examples (Figures 5 and 6), where the integration of text and visuals led to more coherent, expressive, and engaging outputs.

**Figure 5**  
*Example of a Final Student Slide Designed Using Adobe Express*



**Figure 6**  
*Example of a Final Student Poster Designed Using Adobe Express*



These examples illustrate how students’ writing developed when paired with visual expression. The essays remained authentic student work, but by adding AI-generated images, learners were encouraged to treat their writing as a creative project rather than as a purely linguistic exercise. The act of visualizing their ideas helped them refine vocabulary, include more descriptive detail, and experiment with sentence variety, while also strengthening the connection between text and visuals.

Figure 5 shows a final slide created in Adobe Express, and Figure 6 presents a poster that students designed as part of their project. Both tasks required them to integrate written and visual elements into a single, coherent product, which in turn pushed them to think about tone, clarity, and audience engagement.

What is most notable is that this process addressed earlier issues such as plagiarism concerns or overly simplistic writing. Instead, students were motivated to produce more original and higher-quality work. The integration of Firefly and Express effectively transformed the writing task into a design-oriented process—one that supported grammatical accuracy, narrative structure, and creative communication skills in a way that traditional essay writing alone often could not achieve.

## Findings

### Writing Quality

Students’ revised essays showed clearer organization and more coherent narratives after the integration of AI tools. Although minor grammar issues were still present, the overall tone improved, and the texts flowed more naturally. The support provided by Firefly and Express allowed students to concentrate more on developing their ideas rather than being constrained by sentence-level errors.

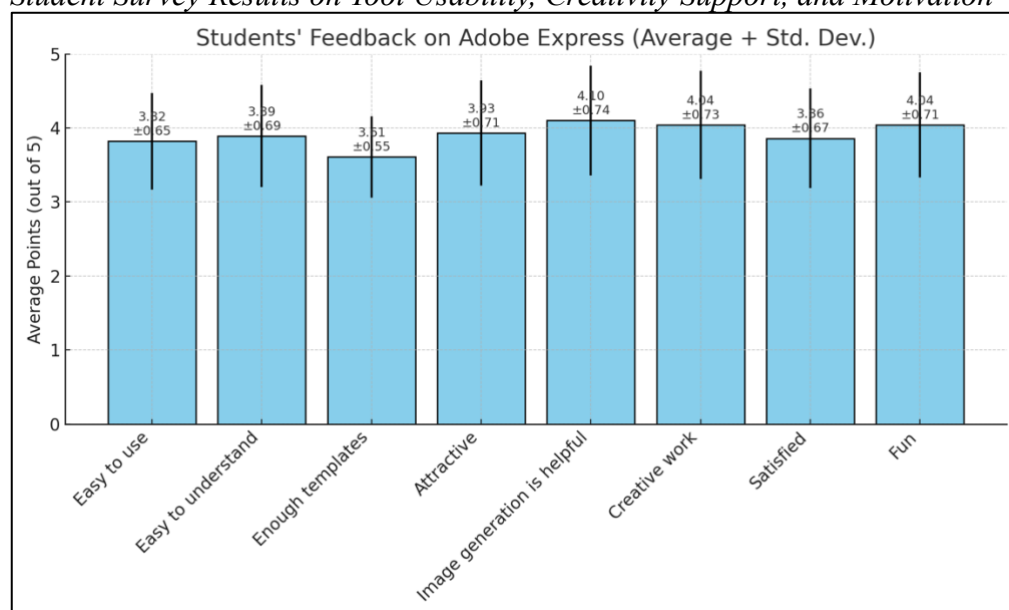
### Creativity and Expression

The addition of visual storytelling pushed students to move beyond formulaic structures. Several reported that generating images led them to rethink what they wanted to say and how best to say it. The process of pairing images with text often prompted students to expand descriptions and refine their narratives, demonstrating a deeper engagement with the writing task.

### Survey Findings

To better understand students’ perceptions, a post-course survey was administered using both Likert-scale items and open-ended questions, supplemented by instructor observations. The results, illustrated in Figure 7, indicate consistently positive evaluations across all categories. Ease of use received a relatively high rating (M = 3.69), showing that most students found the tools accessible. Perceived usefulness for English learning scored even higher (M = 3.98), and support for creativity achieved the top score (M = 4.00), highlighting the tools’ role in fostering expressive outputs. Slide design attractiveness also received a favorable score (M = 3.88), suggesting that Express contributed to more polished and engaging presentations.

**Figure 7**  
*Student Survey Results on Tool Usability, Creativity Support, and Motivation*



Beyond the quantitative results, many students reported that the activities increased their motivation to write in English, confirming the value of integrating multimodal tasks.

### **Student Feedback (Selected)**

Open-ended responses reinforced these findings. A number of students indicated that they intended to use Adobe Express in future presentations, recognizing its practical value. Others noted that the stylish templates enhanced the quality of their slides, while some explained that Firefly-generated images helped them refine their essay ideas and provided inspiration for revisions.

“I plan to use Adobe Express in future presentations.”

“Stylish templates made my slides more appealing.”

“Firefly images helped me refine my essay ideas.”

### **Discussion**

The findings suggest that generative AI tools can significantly enhance both the cognitive and affective aspects of language learning. By combining written and visual elements, students were encouraged to approach writing as a form of storytelling, which not only boosted creativity but also increased engagement and motivation. Importantly, the AI tools acted less as replacements and more as creative partners, encouraging students to iterate on their work and reflect on their choices—key elements of constructivist learning.

At the same time, the project highlighted the need for structured onboarding. A few students initially felt uncertain when using the tools, and this limited their creative output. With clearer guidance and scaffolding, however, these obstacles were reduced, underscoring the importance of careful implementation in technology-enhanced classrooms.

### **Future Directions**

Building on the encouraging outcomes of this project, several directions for further research and practice emerge. First, longitudinal studies would allow us to examine how multimodal, AI-assisted instruction influences students’ writing and presentation skills over an extended period. Second, we plan to apply the Four-Step Creative Learning Model to more specialized STEM writing tasks, such as abstracts, technical reports, or research summaries, to test whether this approach can enhance not only general English expression but also discipline-specific communication.

Another promising avenue is to integrate Adobe’s collaborative functions for peer review, enabling students to exchange feedback on both text and design. Such activities could deepen engagement and foster critical reflection, while also building teamwork and communication skills. Finally, offering structured training in AI prompt design may help students create more precise image-text combinations, further improving the quality of their multimodal projects.

## Extended Pedagogical Reflections

Our observations also highlight broader pedagogical implications. The integration of Adobe Firefly and Express shifted the classroom dynamic from a teacher-centered model toward student-centered creativity. The Four-Step Creative Learning Model offered a supportive structure for beginners, while giving more advanced students space to experiment with both language and design.

Initially, some students were hesitant to use AI-generated content, unfamiliar with prompt-based systems. However, their confidence quickly grew as they experienced the immediacy of generating high-quality images and adapting them to fit their narratives. This aligns with Papert's idea of "learning through making," where creative production leads to deeper understanding.

Collaboration naturally emerged during the design stages. Students exchanged ideas about visual styles, prompts, and layouts—often in English—turning the design process into an authentic communicative task. The interplay between text and visuals also reshaped the revision process: students no longer saw revision as mere error correction but as part of a creative cycle of refinement. This reciprocal adjustment between writing and images enriched both forms of expression.

For instructors, multimodal outputs provided a fuller picture of students' learning, revealing depth that might not appear in text alone. Peer review sessions also became more engaging, as students could comment on both content and design. Overall, the project suggests that generative AI not only enhances language learning but also builds transferable skills such as adaptability, problem-solving, collaboration, and digital creativity—skills that are crucial in STEM fields and align closely with UNESCO's Digital Literacy Framework.

## Conclusion

In sum, integrating Adobe Firefly and Adobe Express into English writing instruction created a new learning environment in which STEM students combined verbal and visual modes of expression. The approach strengthened narrative coherence, creativity, and motivation while promoting broader communicative and digital skills.

Looking ahead, the incorporation of peer collaboration, prompt-design training, and STEM-specific writing tasks could further expand the potential of this framework. As generative AI becomes increasingly integrated into education, its role as a creative partner rather than a simple tool will likely grow, supporting students in developing not only linguistic proficiency but also the broader competencies needed for success in global STEM communication.

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