

Exploring the Effectiveness of Smart Education in a College Writing Course Utilizing Multimedia Learning Tools

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[Abstract]

With the development of AI, multimedia tools in education offer personalized learning environments, which foster individual competencies. This study aims to examine the effectiveness of smart education as perceived by learners through a case study of university writing classes utilizing multimedia learning tools, and to explore potential applications. To achieve this, a writing course incorporating various multimedia tools to promote interaction was designed and implemented over the course of one semester, targeting 42 university students. Through the semester, student reactions and survey results were analyzed to investigate the effects and satisfaction levels regarding the use of multimedia learning tools in writing instruction as perceived by students. The analysis revealed that multimedia-assisted writing classes effectively fostered learners' autonomy by focusing on individual needs, while also promoting interaction and encouraging spontaneous participation. Students reported recognizing the presence of diverse perspectives by comparing and communicating about each other's writing, leading to an expansion of their own thinking. In using ChatGPT, it was found that students attempted to refine their questions until they obtained the desired answers. They reported that this process deepened their understanding of the essence of the questions. These benefits led to results of high levels of students' active class engagement and satisfaction. This study contributes foundational and empirical data regarding the effectiveness and potential applications of learner-centered smart education as part of fourth industrial revolution integration research.

Key Words: Multimedia-Assisted Learning, MALL, Smart education, College writing, Writing education, ChatGPT

I. Introduction

As AI technology has advanced, the integration of multimedia has become indispensable in daily life. This technological progress has significantly expanded and empowered the multimedia domain, with AI seamlessly integrating into various facets of multimedia. AI-based machines hold the potential to imitate or surpass various human cognitive capacities, encompassing abilities such as sensing, language interaction, reasoning and analysis, problem-solving, and creativity [1]. In recent times, with a notable increase in students owning laptops and iPads, university classes have embraced various multimedia

elements. This shift has resulted in the adoption of a paperless format where course materials are delivered as electronic files through Learning Management Systems(LMS). Given that students today have been exposed to technology throughout their lives, they are comfortable with technology and well-suited to engage with digital learning environments. The interactive and dynamic nature of multimedia learning aligns with digital natives' preferences, which enhances their learning experience and engagement in education [2].

Amidst this trend, it has been reported that classes employing diverse multimedia collaboration tools positively impact the development of English communication skills. This impact

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is attributed to the enhanced interaction and active participation facilitated by digital natives' inherent familiarity and adeptness with digital technology [3]. Particularly noteworthy is the recent emergence of ChatGPT, recognized as a valuable tool for enhancing the depth of writing through idea generation, instant information retrieval, and immediate feedback [4].

Under such a dynamic flow, this study aims to introduce a case of university writing classes utilizing various multimedia tools, including ChatGPT. Through vivid students reactions, evaluations, and surveys, the research seeks to explore the effects and significance of incorporating these tools in the writing curriculum. It anticipates that real-time communication and sharing, facilitated by multimedia tools during writing, will promote information and opinion exchange, expand thinking, and cultivate reflection and critical thinking skills, while enhancing the interest and motivation of the MZ generation.

II. Research Background

A. Multimedia-Assisted Learning (MAL) and Smart Learning

Multimedia-assisted learning has gained increasing prominence in educational research as a transformative approach to enhance the effectiveness of teaching and learning processes. Scholars argue that integrating multimedia elements, such as audio, video, and interactive visuals, into educational settings can significantly impact student engagement, understanding, and knowledge retention [5,6]. Their work underscores the importance of aligning instructional design with principles that cater to cognitive processes and multimedia learning, fostering a more impactful educational experience. With the rapid emergence of new technologies, the increasing availability of more multimedia elements allows for more diverse applications and experiences in the educational landscape.

In addition, the recognition of diverse learning styles and preferences has driven the pedagogical shift towards multimedia-assisted learning [7,8]. Alvarez discusses the importance of adapting instructional methods to accommodate varying learning styles, emphasizing that multimedia provides a versatile platform for reaching students with

different preferences [7]. Sweller's Cognitive Load Theory further supports this idea by suggesting that well-designed multimedia can reduce cognitive load and enhance learning outcomes [8]. The convergence of these perspectives highlights the transformative potential of multimedia in creating adaptable and engaging learning environments.

In general, scholars commonly emphasize several key benefits of multimedia-assisted learning, including the integration of media, easy access, rapid retrieval of information, customized learning, interactive learning, increased retention, and motivation. First, multimedia enriches the learning experience by presenting information in a more readily comprehensible manner, using various language-related elements such as texts, images, audio, and video [9,10]. This exposure not only enhances comprehension but also boosts learners' motivation in the classroom. Second, the easy access and rapid retrieval of information provided by multimedia allow learners to save time and concentrate on the subject matter at hand [11]. Third, learners experience increased autonomy as they actively select the most suitable content, allowing them to independently determine their pace and level of mastery using multimedia resources [10]. Fourth, multimedia creates a more interactive learning environment, fostering heighten in an information-rich learning environment [12]. These distinctive attributes of multimedia not only enable learners to actively engage more senses in the learning process [10], but also contribute to boosting interest and motivation through the incorporation of exciting learning resources [10,13,14].

In South Korea, multimedia-assisted learning underwent a substantial reconfiguration into the paradigm of smart education with the announcement of the smart education promotion strategy by the Ministry of Education, Science, and Technology in 2011. Smart learning is built upon a foundation of smart infrastructure components such as clouding, networks, servers, smart devices, coupled with smart approaches like customized, intelligent, convergent, social learning, and collective intelligence [15]. This concept involves utilizing ICT, which facilitates communication, collaboration, participation, openness, and sharing not only between learners and instructors and between learners and content but also among learners themselves [16]. As defined by Lim, smart learning signifies a comprehensive educational approach aiming to enhance the effectiveness of learn-

ing by transitioning from a vertical and unilateral traditional teaching and learning method to a horizontal, interactive, participatory, and collaborative approach [16].

The terms smart learning and mobile learning are used interchangeably in that the development of mobile devices and wireless internet technology has facilitated a learning environment accessible anytime, anywhere. However, smart learning specifically emphasizes the interactivity of the learning process [17]. Kinshuk and Kumar emphasized the importance of smart learning analytics and environments, highlighting that adaptivity relies on integrating domain and pedagogy knowledge [18]. This indicates that while adaptivity is essential, it must be achieved through dynamic interaction facilitated by smart learning environments and analytics. Therefore, further research to utilize pedagogy knowledge in learning analytics for smarter environments is required to enhance decision-making and comprehension of learning impacts within educational settings [19].

B. University Writing Education Transformation

Writing education in domestic universities began to be officially designated and operated as a core mandatory course around 2005. From 2010 to 2015, to enhance the quality of general education, each university established dedicated organizations for general education, and introduced various management systems for university writing education. After 2016, university writing education began to diversify for substantial enhancement, emerging as a key means for improving communication skills among core competencies [20].

However, starting from the first semester of 2020, the unexpected advent of COVID-19 led to a complete shift to fully online education. Lectures recorded or delivered via Zoom by instructors in a one-sided manner led to challenges such as reduced learner participation, interest and motivation. In response, the Ministry of Education announced the “Ten Major Policy Tasks for Future Education Transformation Post-COVID”, aiming to intensify the establishment of a digital transformation education infrastructure and collaborative educational governance [21]. The accelerated digital transformation prompted by COVID-19 resulted in the creation of a system that could seamlessly integrate online

and offline classes, extending beyond the pandemic. Universities have been organizing workshops on diverse innovative teaching methods and actively promoting their integration into existing courses for curriculum development [22].

In the dynamic landscape of educational innovation, this study centers on utilizing multimedia learning tools in a university writing course to enhance communication competence. The literature on smart learning indicates a predominant focus on developing smart learning systems or tools, with limited attention given to designing pedagogies and learning activities tailored for smart learning environments [23]. In this respect, this study explores the effectiveness of incorporating diverse multimedia tools in writing classes to engage digital-native learners.

III. Methodology

A. Participants and Research Context

The participants in this study were 43 students who took the basic writing course taught by the researcher at a 4-year university located in Gyeonggi-Province during the second semester of 2023. Among them, 31 were freshmen, eight were sophomores, three were juniors, and there were no senior. The gender distribution included 23 males and 20 females. The basic writing course as a mandatory general education subject consists of 2 hours per week and carries 2 credits, involving both theory and writing practice. The goal of this course is to cultivate the fundamental skills of writing various types of essays logically and smoothly, as required in university settings. Since 2020, the researcher has actively incorporated multimedia tools into this course and conducted classes in a paperless format except for unavoidable circumstances.

B. Data Collection Procedure and Analysis

This study focuses on exploring the effectiveness and satisfaction with smart education as perceived by students through a writing course that incorporated multimedia learning tools. To achieve this, the research tools employed in this study include reflective e-journals, self-assessment of

learning, and a survey on the effectiveness of multimedia-assisted writing classes, and the end-of-semester course evaluations conducted by the university.

At the beginning of the semester, a survey on students' background, including age, gender, grade, major, writing experience, and self-assessment of writing efficacy, was conducted via Google Form link. Starting from the second week, participants were asked to write a reflective e-journal on the LMS bulletin board on a weekly basis. The journal entry should include the most important or impressive thing learned during each class, and a challenging point that requires further exploration in the covered material. Additionally, students were expected to rate their attitude on a scale from 1 to 10, accompanied by comments on each class. The multimedia learning tools used in the course included Padlet, Mentimeter, Kahoot, Google Docs, Kakao Openchat, and the LMS.

In the 13th and 14th weeks, a survey on the effectiveness of multimedia-assisted writing classes was administrated via Google Form link. The survey questions were developed based on the educational expectations of Multimedia-Assisted Learning (MAL) commonly mentioned by scholars discussed in Chapter 2. The questions belong to four categories as follows;

Table 1. The four categories of the effectiveness on MAL

Effectiveness on Multimedia-Assisted Learning	
1	Providing an engaging learning experience through diverse and exciting media tools
2	Time-saving and concentration enhancement through easy access and rapid retrieval of information
3	Increasing autonomy and customized learning by actively selecting the most suitable content based on individual levels and pace
4	Actively encouraging engagement in the learning process in a learning environment that promotes interaction

Additionally, two categories, writing self-efficacy and overall satisfaction, were included alongside these four themes. Thus, the survey comprises a total of 18 questions across six categories (refer to Table 4). The quantitative data were analyzed utilizing the SPSS 18.0 package and qualitative data obtained from reflective e-journal and short essay questions in the survey were incorporated to support the statistical results.

Table 2. Research tools employed in the study

Week	Data	Tools
1st~2nd	Basic background	Google Forms
2nd~14th	Reflective E-journal	LMS
13th~14th	Main survey	Google Forms
14th~15th	Course evaluation	Portal

IV. Multimedia-Assisted Writing Classes

A. Multimedia-Assisted Writing Class Implementation

This class was designed to maximize the interest, motivation, interaction, personalized learning, and self-directedness of digital native MZ generation students taking a writing course by incorporating multimedia learning tools into the curriculum. With the exception of unavoidable circumstances, all learning materials were uploaded to the LMS in a paperless format. The classes, consisting of theory and practical exercises, were conducted using various multimedia tools and activities. Consequently, students were encouraged to participate in various writing-related class activities using electronic devices such as smartphones, laptops, or iPads.

First, the class begins with greetings and attendance check, followed by a review of important concepts learned in the previous session using Kahoot. Students access Kahoot via a QR code, enter their names, and join the session. They then click on the correct answers to 5-7 multiple-choice questions displayed on the screen within 20 seconds. The rankings of the students who answered correctly the fastest appear on the screen, creating an engaging atmosphere as the rankings continuously change after each question. Following the review, an overview of the day's lesson is presented, and students download a PowerPoint presentation with blanks uploaded to the LMS. In groups, they have time to fill in the blanks. Once the group activity is complete, the instructor conducts a mini-lecture, explaining the words and concepts that fill the blanks in a question-and-answer format. As a wrap-up for the theoretical part of the class, students access Padlet to summarize key points about the day's learning, add comments, or engage in activities such as posing questions and providing answers through comments.

Next, the topic is revealed for the given writing, and

Table 3. Multimedia tools used in class

Class Activities	Multimedia Tools	Remarks
Review Quizzes	Kahoot	QR code access rankings show top 5 after each question
Lecture	LMS PPT	Group filling of blanks followed by Q&A-style lecture
Wrap-up	Padlet	Summary or Posing questions and answering
Sub-topics & Grouping	Mentimeter, Openchat	Generating specific subtopics and Grouping
Group work	ChatGPT, Google Docs	ideation & outline Collaborative/ Individual writing projects
Feedback	Padlet	Exhibition, Sharing Feedback through Comments

students are encouraged to think about specific subtopics they would like to explore. Depending on the nature of each week's class, students generally access Mentimeter via an Openchat link to categorize the subtopics written by their peers into 5-6 themes. Groups are then formed based on the themes they choose. Each group engages in brainstorming and utilizes ChatGPT to ideate and create an outline. The instructor provides feedback on the outline, and depending on the week's focus, weekly individual or collaborative writing task begins.

For individual writing, students post their work on Padlet, where peers provide feedback through comments. Occasionally, a vote is conducted to select the best work. Collaborative writing projects include creative writing, such as parody storytelling, and critical writing, involving argumentative essays. Once subtopic selection and group outlining are complete, Google Docs is used for collaborative writing, allowing group members to discuss and finalize the writing project together. The completed collaborative writing project, with feedback from the instructor, is then uploaded to Padlet for sharing with other students. This allows for mutual feedback through comments.

B. Results of Data Analysis and Discussion

In the assessment of the reliability of the survey items conducted after implementing a writing course utilizing multimedia tools, the Cronbach's α coefficient showed a relatively high overall reliability at .803. The reliability for individual categories ranged from .726 to .882. The mean for the entire

Table 4. Descriptive statistics on the effectiveness of MAL (N=42)

Category (Num. of Items)	M	SD	Cronbach's α
Engaging Learning Experience (3)	4.69	.387	.837
Time-saving & Concentration Enhancement (3)	3.87	1.03	.726
Autonomy & Customized Learning (3)	4.77	.672	.785
Active Engagement in an Interactive Environment (3)	4.89	.401	.882
Sub Total (12)	4.55	.623	.808
Writing Self-Efficacy (3)	4.52	.891	.741
Overall Satisfaction (3)	4.91	.356	.848
Total (18)	4.61	.623	.803

set of items on the Likert 5-point scale was 4.61 (SD=.623). The mean for the educational effectiveness of multimedia-assisted learning was 4.55 (SD=.623), showing an overall positive perception. Examining specific categories, 'overall satisfaction' had the highest mean (M=4.91), followed by 'active engagement in an interactive environment' (M=4.89) and 'autonomy & customized learning' (M=4.77), whereas 'time-saving & concentration enhancement' had the lowest mean (M=3.87). These mean scores collectively suggest that students hold a significantly positive perception of the effectiveness of the course using multimedia tools.

Table 5. The Top Five Highest-scoring Items (N=42)

Rank	Items [Do you think that ...]	M (SD)
1	16. you are satisfied with the overall impact of multimedia-assisted learning on your learning experience?	4.97 (.892)
2	18. multimedia-assisted learning positively influenced your overall satisfaction with your writing journey?	4.93 (.709)
3	12. you actively participate in interactive tasks facilitated by multimedia tools?	4.92 (1.07)
4	10. multimedia can foster an interactive learning environment?	4.83 (.562)
5	3. multimedia contributes to creating an exciting and comprehensible learning environment for learners?	4.76 (.634)

Looking at individual items, the highest-scoring question was #16 ("You are satisfied with the overall impact of multimedia-assisted learning on your learning experience," M=4.97), followed by #18 ("Multimedia-assisted learning positively influenced your overall satisfaction with your

writing journey,” M=4.93), and #12 (“You actively participate in interactive tasks facilitated by multimedia tools,” M=4.92), all showing very high means above 4.9. Since #16 and 18 pertain to overall satisfaction, these results indicate a very high level of student satisfaction with the course. The top five highest-scoring items are detailed in Table 5.

The survey results, demonstrating a high level of satisfaction among students in a multimedia-assisted writing course, align well with the theoretical perspectives discussed by several scholars such as Alvarez [7]. Firstly, the high scores on #16 and #18 related to overall satisfaction support the idea that multimedia, as discussed by Alvarez [7], enriches the learning experience by presenting information in a more readily comprehensible manner. The varied use of elements such as texts, images, audio, and video aligns with research by Davey, Jones, and Fox [9] and Perzylo [10], contributing not only to enhanced comprehension but also heightened motivation in the classroom. Secondly, the positive feedback on #10, and #12 related to an interactive learning environment aligns with the concept of multimedia fostering heightened engagement in an information-rich learning environment, as discussed by Gardner and McNally [12]. This indicates that the multimedia tools used in this course not only allowed for active engagement of multiple senses in the learning process but also contributed to increased interest and motivation, in line with the ideas of Laurillard [13], Lee [14], and Perzylo [10].

These results are well-reflected in the weekly reflective e-journals that students posted. Especially, students displayed great enthusiasm during the Kahoot quizzes, which were designed to review key concepts learned in the previous class. A lively atmosphere was created upon completion of each question, upbeat music played, and the names of the top five students who answered the fastest were displayed. The dynamic nature of the rankings, constantly changing, encouraged active participation from all students.

“When we review with Kahoot, it’s subtly tense but fun. At first, being in the top 5 didn’t seem very important, but last week when I saw my name in the top 5, I felt very proud. So, today, I reviewed what we learned last week even on the subway on my way to school.” (Excerpt from H’s 5th-week reflective e-journal)

Moreover, students reported an increased awareness of diverse perspectives and improved interactive communication through various writing activities facilitated by Padlet and Google Docs. Activities involving writing on Padlet, reading each other’s posts, and exchanging peer feedback through comments seem to deepen critical thinking more effectively than verbal discussions. Observations indicated that students found this activity helpful in expanding their viewpoints, discovering convincing aspects even in opinions different from their own.

“During today’s class, discussing ‘euthanasia’ was particularly impressive. Investigating various grounds for both supporting and opposing views and sharing them on Padlet made me realize how diverse human thoughts can be. During oral discussions, I might overlook these aspects, but when we have to organize our thoughts in writing with supporting evidence, it seemed to deepen our thinking. Initially, I thought I was naturally against it, but as I learned more about the supporting stance on Padlet, it felt like my narrow perspective expanded.” (Excerpt from K’s 12th-week reflective e-journal)

Finally, in writing activities utilizing ChatGPT, students discovered the advantages of personalized learning tailored to their own pace and understanding. Particularly, they noted that while writing, they could address various questions that arose without the need to individually ask the professor or peers. This allowed them to seamlessly focus on progressing to the next step. Additionally, it was found that by refining their questions until they obtained the desired answers from ChatGPT, they were able to deepen their understanding of the essence of the questions.

“The most impressive thing today was trying ChatGPT for the first time. It was awkward to ask my neighbor or the professor every time something I didn’t know came up, but asking ChatGPT provided immediate answers, which was fascinating. When the response wasn’t what I wanted, the professor advised me to ask more specific questions. As I continued to ask detailed questions, I realized that my original questions were too vague.” (Excerpt from L’s 9th-week reflective e-journal)

V. Conclusion

In order to investigate the effectiveness and satisfaction of multimedia-assisted writing classes as perceived by students, a writing course incorporating multimedia tools including ChatGPT was designed and conducted over the course of one semester. Throughout the course implementation, student reactions and survey results were analyzed to gauge the impact of multimedia usage on writing instruction and assess overall satisfaction among students.

When considering the comprehensive analysis of both quantitative and qualitative data, the results of this study demonstrate that a writing course utilizing multimedia tools has compelling elements that actively engage students. The incorporation of appealing multimedia features not only fosters interactive communication, but also deepens understanding of diverse perspectives from other students, encourages students to formulate sophisticated questions, and promotes personalized learning in an information-rich environment. These features resulted in a high level of students' satisfaction with the course. In the midst of the rapidly evolving trends in educational innovation, this study highlights the importance of integrating smart education into the writing curriculum. Utilization of multimedia tools that attract active engagement from digital native learners becomes crucial for the evolution of the writing curriculum.

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