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PAPER

When Literature Meets Computer: A Case Study of Curriculum Innovation

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ABSTRACT

Curriculum in English literature at universities is increasingly essential to address contemporary educational demands and societal changes. This study introduces a curriculum innovation that combines literature and computer science in a course titled Western Novels for Young Adults, offered by the Department of English at a university in Taiwan. The course's design, implementation, and evaluation are described in detail. According to students' feedback and evaluations, the course effectively enhanced both literary knowledge and digital literacy. Moreover, students reported a strong sense of accomplishment through their assignments and final projects. The findings and discussions highlight key aspects of this interdisciplinary approach and underscore its relevance in the context of modern higher education.

KEYWORDS

literature, computer science, curriculum innovation

1 INTRODUCTION

Nowadays, with the rapid development of technology and engineering, the demand for science, technology, engineering, and mathematics (STEM) majors in higher education is increasing [1], [2]. The global rise of artificial intelligence further accelerates this trend [3]. Consequently, students' choice of academic majors is increasingly influenced by market demands and career prospects, resulting in a decline in enrollment in literature-related disciplines [4], [5], [6]. Simultaneously, students within literature-related fields often express concerns regarding the practical applicability of their learning in the future. The phenomenon indicates a growing gap between traditional literature education and the rapid evolution of modern society.

In order to better incubate students with literature-related majors in the 21st century, several curriculum innovations are proposed [7], [8]. Beyond the optimization of language skills courses, curricular integration, and the introduction of

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application-oriented content, many curriculum innovations emphasize cultivating interdisciplinary competencies and digital literacy [9], [10]. As the boundaries between disciplines continue to blur, students are expected not only to acquire in-depth knowledge within their own fields but also to integrate and apply skills from diverse domains.

Universities worldwide are actively promoting interdisciplinary learning, encouraging students to combine expertise from the humanities, sciences, and technology [11], [12]. This approach aims to cultivate students who can think critically, communicate effectively, and solve complex real-world problems through cross-domain collaboration. Meanwhile, digital literacy has emerged as a core competency in the 21st century [13], [14]. Beyond fundamental computer skills, it encompasses the ability to navigate digital environments, evaluate online information critically, and utilize technological tools for learning, communication, and creation. For students in the literature-related disciplines, acquiring digital literacy opens up new possibilities for research, expression, and professional development. Incorporating digital literacy and interdisciplinary approaches into literature education not only aligns with current educational trends but also addresses students' evolving learning needs.

To address these aims, this study specifically investigates the following research question: "How can the integration of literature and computer science enhance students' interdisciplinary learning, computational thinking, and digital literacy?" To investigate this question, the course Western Novels for Young Adults, offered by the Department of English in one university, is redesigned to integrate web design concepts and skills into the original curriculum. The design is inspired by several theoretical perspectives. First, constructivist learning theory emphasizes that learners actively construct knowledge through hands-on engagement and practice, which supports the project-based approach of combining literature with web design [15]. Second, principles of interdisciplinary education highlight the importance of connecting concepts across domains to foster higher-order thinking, creativity, and problem-solving [16]. Finally, research on AI-enhanced learning suggests that generative artificial intelligence tools such as ChatGPT can serve as cognitive scaffolds, effectively supporting students' exploration and knowledge construction [17], [18]. Building on these perspectives, the major goal of this curriculum innovation is to develop interdisciplinary learning and digital literacy among English major students, in addition to enhancing their literature knowledge and competencies.

2 CURRICULUM DESIGN AND IMPLEMENTATION

2.1 Educational context

The curriculum innovation was implemented within the Department of English at a university located in eastern Taiwan, which is part of the College of Humanities. As of 2025, the department comprises nine faculty members, 113 undergraduate students, and 15 graduate students. The department is dedicated to enhancing students' English proficiency and cultivating their interest in British and American literature, English teaching, and applied linguistics.

Several faculty members, especially the author of this study, actively promote curriculum innovation as a means to better prepare students for future interdisciplinary challenges. This commitment is reflected in the development of courses

that integrate English studies with other fields such as marketing, computer science, and picture book creation, thereby fostering cross-disciplinary collaboration and expanding students' knowledge and creativity.

2.2 Course background

The course western novels for young adults was selected as the target of curriculum innovation. It is an elective, two-credit course offered to junior and senior students in the Department of English. Traditionally, the course focuses on the instruction, discussion, and analysis of three to four novels. Now, the topic of web design is included in the curriculum. Table 1 shows the syllabus of western novels for young adults. It is co-designed and co-taught by two instructors from different academic backgrounds. The first instructor is an associate professor in the Department of English, with expertise in children's literature, fantasy literature for children and young adults, English language teaching, and language and literacy education. She is responsible for the first half of the course, which focuses on the instruction, analysis, and discussion of two selected novels. The second instructor is an associate professor in the Department of Mathematics, with expertise in software engineering, data science, and computer science education. He is responsible for the second half of the course and focuses on the knowledge and skills of web design. Both instructors have over ten years of teaching experience and have received university-level teaching awards in recognition of their curriculum innovation and instructional excellence.

A total of eight students participated in the course, including three juniors and four seniors from the department of English, as well as one senior from the department of information science and management systems. This relatively small class size allowed for personalized instruction and facilitated close collaboration between students and instructors.

Table 1. Syllabus of western novels for young adults

Week	Topic	Week	Topic
1	Introduction/Critical Thinking Exercises	11	Introduction to Web Design
2	Holiday	12	Introduction to HTML
3	Literary Theory a Glimpse	13	Introduction to HTML
4	The Hunger Games Ch. 1–9	14	Introduction to HTML
5	The Hunger Games Ch. 10–19	15	Holiday
6	The Hunger Games Ch. 20–27	16	Design with Templates and AI
7	Holiday	17	Web Design Presentation
8	Coraline Ch. 1–6	18	Final Week
9	Coraline Ch. 7–13		
10	On the Hunger Games (Prof. Claudia Nelson)		

2.3 Assignments and the final project

During the first half of the course, two individual assignments are given. The first assignment is a dialectical journal, in which students are expected to record

a conversation between the ideas presented in the novel and their own personal reflections. They can write down the parts that strike or move them and respond with their own thoughts, questions, insights, feelings, and reactions. Students are also encouraged to reflect upon their own life experience or their childhood memories to make meaningful connections with the content of the novel. The second assignment is a book of knowledge. Based on the topics inspired by the selected novels, students can choose a specific topic and create a small book of knowledge with three to six entries. Examples include edible plants found on the campus, fashion design of The Hunger Games, survival skills inspired by The Hunger Games, and other interesting topics.

In the second half of the course, two individual assignments and the final web design project are arranged. The requirement of the first individual assignment includes 1) investigating and presenting the development trajectory of one particular web page through the Internet Archive, and 2) introducing their favorite and least favorite web pages from the perspectives of content, layout, user interface, user experience, and so on. This task cultivates analytical skills and familiarity with web evolution and usability principles. The requirement of the second assignment is to build a personal self-introduction web page and deploy it to a public platform (e.g., GitHub). Students are encouraged to design the layout and the style of their web pages. They are also encouraged to search, learn, and appropriately reuse code from the Internet. Moreover, generative artificial intelligence tools (e.g., ChatGPT) can be used during the implementation [19]. If students use code from online sources or generative artificial intelligence tools, they are required to clearly document and acknowledge these sources in their assignments. This assignment aims to develop students' computer science knowledge, web design skills, and ethical standards in technology use.

For the final web design project, students collaborate in groups to develop a web page that synthesizes their literary interpretations and web design competencies. The content of the web page can include their dialectical notebooks or any written or visual works related to the two novels in class. Each group will present the web page in class, and the presentation must be conducted in English. Each member in the group shall take turns to speak and should be thoroughly familiar with the content and be able to help each other out any time during the presentation.

These assignments are carefully designed to scaffold critical thinking, interdisciplinary integration, and digital literacy development. Through the assignments, students are expected to be able to tackle complex real-world challenges by combining literature knowledge with technological proficiency.

3 COURSE EVALUATION AND REFLECTIONS FROM STUDENTS

In order to evaluate the efficacy of the curriculum innovation, both quantitative and qualitative data are collected and analyzed. Quantitative data are obtained from students' responses to a standardized evaluation questionnaire, while qualitative data are collected from the reflections by students. These data offer insights into the course's effectiveness, the challenges faced by students, and their learning progress throughout the semester. In addition, classroom participation and inquiries, individual homework, and final web design projects also serve as valuable approaches to assess the learning of students.

3.1 Quantitative evaluation results

At the end of each semester, students are invited to complete a course evaluation questionnaire designed by the university. The evaluation assesses both the course content and the instructor's performance. The evaluation statements are presented as follows.

1. The course content is well-aligned with the syllabus.
2. The course is stimulating and interesting.
3. The course objectives are clearly defined and successfully achieved.
4. The course materials are well-organized, clear, and helpful for learning.
5. The course assessments are fair and reasonable.
6. The instructor demonstrates a professional and committed attitude toward teaching.
7. The instructor explains the course content clearly and in an organized manner.
8. The instructor adapts teaching methods or pace according to students' learning progress.
9. The instructor is willing to assist students in overcoming learning challenges.
10. The instructor provides timely and useful feedback and guidance.

The evaluation statements are rated on a five-point Likert scale: "Strongly Disagree," "Disagree," "Neutral," "Agree," and "Strongly Agree," corresponding to scores from 1 to 5, respectively. Descriptive statistics, including means and standard deviations, are calculated to assess overall trends. The results show that the course receives a higher average score (4.87) compared to the averages of courses offered by the department (4.60), the college (4.39), and the university (4.45). It shows that significant improvements are achieved through the curriculum innovation.

3.2 Qualitative evaluation results

In addition to the course evaluation questionnaire, students are invited to write their own reflections at the end of the semester. These reflections are analyzed by two instructors to identify students' learning experiences, challenges, and perceived benefits of the course. The analysis provides valuable qualitative insights into the effectiveness of the course that can be obtained and serve as a useful reference for future curriculum improvement and refinement.

Based on the reflections, it can be found that in the beginning, students are afraid of the web design part of the course. As English majors with limited or no background in computer science, they express anxiety and uncertainty about learning web design. These reflections also emphasize the importance of thoughtful course design and instructional support. The following are excerpts from student reflections.

> *"At first, I was really worried about my final assignment, because I am not good at any kind of math or computer."*
>
> —Course reflection 2

> *"Initially, I didn't expect that I would keep taking this class after midterm week."*
>
> —Course reflection 3

"At the beginning, I was really frustrated because I am really bad at program writing. However, I don't dislike it. I think I would want learn more about it."

—Course reflection 5

Students also mention the instructor's supportive teaching style and the clarity of instructional materials, which facilitate their learning and implementation of web design. The following are excerpts from student reflections.

"Professor Kao is also a very friendly teacher. Although he taught us how to upload our websites, we often forgot how to do it. However, he patiently taught us again each time and cared about whether we could follow along."

—Course reflection 1

"Professor Kao taught us Program Language with a clear and easy way."

—Course reflection 2

"I appreciate for the instructor's hard work. It's not easy to teach a student how to write a webpage in one semester, not to mention in just a few weeks, yet you still manage it."

—Course reflection 7

Finally, based on the course reflections, many students express a strong sense of accomplishment. Students appreciate the opportunity to integrate literature with computer science and feel proud to develop great web pages from scratch. Several students hope that the course can be offered continuously in the future.

"Although it is hard to do the final assignment, I am really proud about my progress. This lesson made me combine my imagination with computer lessons, and also thrived my interest on designing websites. I really learned a lot in this course."

—Course reflection 2

"Thank God I didn't drop out at that time, because I truly experienced the amazement of designing a website from scratch!"

—Course reflection 3

"This course is very interesting. It encouraged me to read novels and helped me develop my critical thinking skills in literature. In the second half of the course, I learned how to create a simple webpage using HTML, which gave me a strong sense of accomplishment. I'm glad I took this course during my time at university, and I hope it will continue to be offered in our department."

—Course reflection 4

"This combination is really fascinating."

—Course reflection 5

"I knew nothing about how to create a website at first, but now, my classmate and I have tried to build a website from scratch, and we did it. I felt very proud of myself, because I never thought that I could do it."

—Course reflection 6

4 DISCUSSION

4.1 Integrating computer science into literature curricula

As the demand for STEM majors continues to grow, computer science-related courses are increasingly being integrated into the curricula of literature, humanities, and arts programs in higher education. The goal is to establish computational thinking and digital literacy of students. However, it is inappropriate to set up computer sciences-related courses without proper content modification and adaption according to the requirements and characteristics of students in literature-related disciplines [20], [21].

Thus, web design is selected and integrated into the class according to the experience of students and the time constraint (about five weeks). The instruction begins with an introduction to fundamental web design concepts to provide students with a general understanding. In addition, the history of web design since 2000 is presented for students to realize the evolution of design practices over time. Then, tools used for web page editing (e.g., Sublime Text) and platforms for deployment (e.g., GitHub) are introduced. The use of a public platform like GitHub allows students to publish their web pages and share them with others, thereby enhancing engagement and fostering a sense of accomplishment. When introducing HTML, tags are carefully selected, with an emphasis on those that are important and commonly used. Complex or rarely used syntax are avoided. This approach ensures that students acquire foundational knowledge while minimizing cognitive overload during the learning process [22].

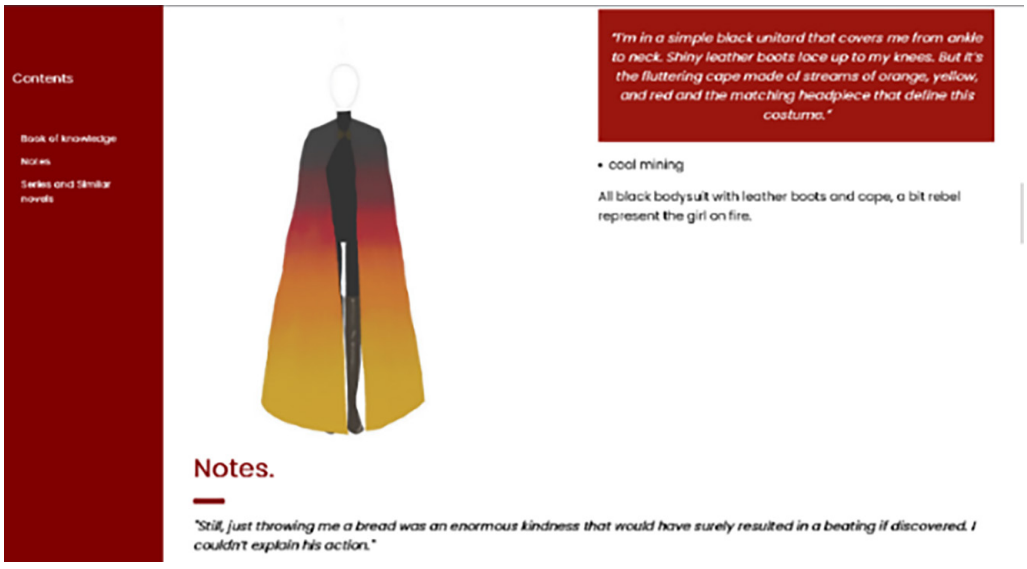

Fig. 1. The final web design project

At the end of the class, students can use what they learn in the web design to build a web page that showcases the authors and contents of the novels, as well as their own thoughts, questions, insights, feelings, and reflections. Figure 1 illustrates the web page built by students, which demonstrates both technical competence and literary engagement.

4.2 Generative artificial intelligence as a learning companion

In the second stage of the class, web design is introduced to students with English majors. They have no prior experience with computer science or related subjects. It is the first time for them to use their laptops for programming or development tasks. Thus, the instructor encourages students to collaborate with generative artificial intelligence (e.g., ChatGPT) when learning and implementing their own web pages. The course begins by covering the fundamental concepts of web design, the development tools, and HTML tags for students. After introducing a series of HTML tags, a practical task (e.g., a simple CV web page) is demonstrated with the assistance of generative artificial intelligence tools for students. When giving the prompt, the phrases “simple” and “without any style” are used. Thus, the output of ChatGPT can be aligned with the knowledge learned by students. In addition, the instructor teaches students how to understand the output of the tool and adjust the content based on previous knowledge of HTML tags.

As shown in Figure 2, students can create their own CV web page based on the process learned from the course. This approach not only facilitates the learning of web design but also fosters a strong sense of achievement among students, many of whom express increased confidence and motivation as a result of their success in completing the task.

Fig. 2. Self-introduction homework

4.3 Scaffolded assignment design and interdisciplinary continuity

Before the implementation of the class, two instructors carefully design all the assignments for students with the intention of bridging the literature-focused stage and the web design stage. Through the assignments, it is expected that students can get insights into the application of computer science knowledge and skills in literature. As previously described, the first half of the course includes two individual assignments, including a dialectical journal and a book of knowledge. On the other hand, in the second half of the course, two individual assignments and the final web design project are arranged. During the first stage, students produce lots of valuable

and great artifacts, including personal reflections, illustrations, photographs, and so on. These artifacts can be reused in the final web design project at the second stage.

For instance, the "book of knowledge" assignments are originally submitted as Word documents during the first stage of the course. As shown in Figure 3, it can be found that these great and creative works by students are later reused and integrated into the final web design projects. This scaffolded assignment design not only ensures that students' earlier efforts are meaningfully preserved throughout the course but also highlights the interdisciplinary integration of literature and computer science [23]. Through the series of assignments, students can gain a deeper appreciation for the collaboration across disciplines and the value of combining creative and technical skills.

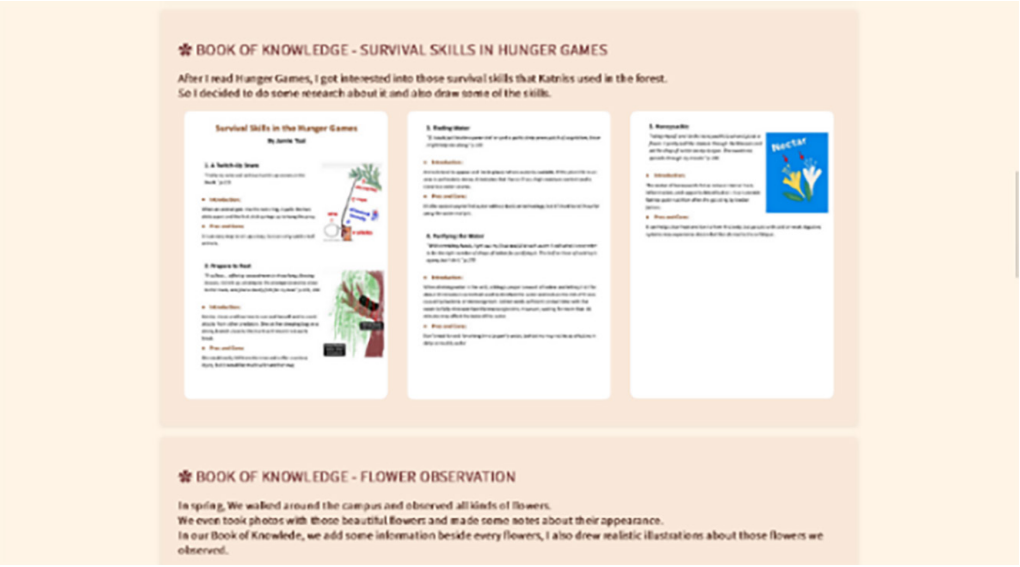

Fig. 3. Web design project reusing artifacts in assignments

4.4 Potential concerns

Several concerns of the curriculum innovation are described in the following. First, the five-week schedule for web design is too short. As a result, students may lack a comprehensive understanding of the subject and have insufficient time to practice. It also limits opportunities for deeper technical exploration. While students are able to complete basic implementations, more advanced design concepts such as CSS styling, responsive layouts, or JavaScript interactivity are omitted. The arrangement of the curriculum should be carefully considered from different perspectives.

Secondly, while generative artificial intelligence tools offer valuable support, their effectiveness depends heavily on prompt quality and the user's ability to interpret the outputs. Without sufficient understanding and guidance, students may rely too heavily on these tools, which has a negative impact on their learning, critical thinking, and problem-solving abilities. In addition, due to the limited instruction time mentioned earlier, students may struggle to interpret and adapt the more complex outputs provided by generative artificial intelligence tools. To address this, additional instructional support and guided practice could be incorporated into the curriculum.

Thirdly, ethical concerns such as academic integrity and authorship arise when generative artificial intelligence tools are used, potentially blurring the line between learning and plagiarism. From a broader educational perspective, the integration of artificial intelligence also raises questions about the role of technology in shaping students' learning autonomy and academic values. Rather than positioning artificial intelligence as a substitute for human creativity and judgment, it should be employed as a scaffold to support exploration and reflection, consistent with constructivist approaches to education.

Finally, the success of the curriculum innovation relies heavily on the agency of instructors. From course design to implementation, mutual trust and collaboration among instructors are keys to the curriculum innovation. However, the sustainability of curriculum innovation cannot depend solely on teachers' enthusiasm. Establishing a sustained professional learning community (PLC) along with dedicated resources can further support the ongoing implementation and continuous refinement of the curriculum [24].

5 CONCLUSION AND FUTURE WORKS

This study presents a curriculum innovation in the course Western Novels for Young Adults, offered by the Department of English at a university. The main improvement involves the integration of literature with computer science for students to enhance their interdisciplinary learning, computational thinking, and digital literacy. Evidence from student evaluations and reflections suggests that the redesigned course not only improves their knowledge in both literature and web design but also fosters a strong sense of confidence and accomplishment through the implementation of web pages.

The design of the curriculum and the implementation of the course are presented in the study. Key findings highlight the effective integration and adaptation of computer science topics, the meaningful use of generative artificial intelligence, and the careful design of assignments. This study is expected to serve as a foundation for future research and practical applications in curriculum development in similar contexts.

Nevertheless, several limitations should be acknowledged. First, the sample size in this study was relatively small, which limits the generalizability of the findings. Second, the research design was exploratory in nature and therefore cannot provide strong causal inferences. Finally, while generative artificial intelligence tools such as ChatGPT were incorporated into the course, the ethical and pedagogical risks associated with their use, such as potential over-reliance or issues of academic integrity, can be further investigated.

Based on current research results, future work can be divided into two main directions. The first is to extend and redesign additional courses within the Department of English. For instance, introducing knowledge and skills in natural language processing could enable students to perform literary analysis from computational perspectives, leading to deeper insights. The second is to explore the possibilities to integrate computer science into other disciplines. Such innovations require careful curriculum design based on the requirements and capabilities of students, ensuring that interdisciplinary courses effectively prepare them for future challenges. Moreover, follow-up studies with larger samples and more rigorous comparative designs will be essential to validate and extend the present findings.

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