STEM Education Model in New Media Courses Research: AIGC Graphic Application and Impact

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Abstract. The "STEM education model", proposed by the United States, consists of Science, Technology, Engineering, and Mathematics, which emphasizes interdisciplinary learning and application, and the application of new technologies in the learning of liberal arts. Through the STEM education model, this research investigates how to introduce technologies in new media courses, using AIGC as a medium to guide students in applied learning, and then using questionnaires to understand the extent to students' understanding of STEM education has been enhanced, to serve as a reference for the research of related new media courses.

Keywords: STEM Education; AIGC; new media; teaching; big data

1 Introduction

The "STEM education" was coined by the U.S. National Science Foundation (NSF) in response to U.S. concerns about keeping the country ahead of the competition. STEM education is under the direction of the humanities, STEM education is an acronym for Science, Technology, Engineering and Mathematics, emphasizing interdisciplinary learning and application, aiming to cultivate students' innovation, problem solving and teamwork.

The concepts and methods of STEM education, which are consistent with the development of teaching and learning in New Media courses, include:

Integration of science, technology, engineering, and math for a comprehensive learning experience, this integration helps demonstrate the relevance of these disciplines and allows students to understand the intersections and practical applications of knowledge.

Emphasizes an approach to solving real-world problems and challenges that stimulates students' curiosity and creativity by posing questions, exploring solutions, and implementing designs. Students are encouraged to participate in real-world projects and experiments to develop hands-on and practical skills, which help deepen their understanding and stimulate their interest. [1]

Emphasize teamwork and communication skills, encourage students to work together in groups to solve problems, share ideas and resources, develop teamwork and communication skills, encourage students to think creatively, develop critical thinking skills, and help students learn to examine problems and come up with novel solutions.

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STEM education such as project-driven learning, experimenting and inquiry-based learning, design thinking, scientific and technological competitions, and problem-based learning, are in line with the application orientation of new media education. It is expected that the spirit of STEM education will be introduced into the media education of literary disciplines, and that teachers will play the role of guides and motivators to guide students in exploring and learning, and to encourage the application of what they have learned to solve real-world problems. Through scientific and technological means such as big data exploration, the use of software capabilities to find answers to new media questions and the use of new liberal arts skills will be more helpful to the social practice of talent cultivation.

2 Trends in STEM education research

Since 2000, there have been a lot of research papers on STEM education in foreign countries, mainly focusing on the fact that STEM education is different from traditional teaching and does not instill knowledge in a one-way way, and adopts the method of guiding students to think critically, combining cross-disciplinary knowledge and skills, and solving the problems that will be encountered in the real world. It aims to cultivate a generation of active learners who enjoy learning.

Harvard University scholar Anon's "Why STEM Education is Becoming Increasingly Important" study shows that the U.S. can increase its per capita GDP by improving math skills. Over the past 80 years, if math achievement were at the level of Canadian students, the U.S. annual growth rate would have increased by 0.9 percent. The growth rate would have increased by 0.9 percentage points. And if it were at the level of Korean students, the growth rate would be 1.3 percentage points higher. This would add $7.5 trillion to the U.S. GDP. It is clear that STEM education has a significant impact on social practice .

Research on STEM education in teaching and learning, scholars Y Xie, M Fang, K Shauman and other research, STEM education for life problems, through the engineering design, production and refinement of the core activities, as the main axis of the curriculum and teaching, the course and the integration of the use of science and scientific inquiry, mathematics and mathematical thinking, as well as technology and tools, in order to produce products and solve real-world problems . [2]

With regard to the research on STEM education in terms of teaching and research results, foreign scholars, such as Josh Brown, explored the basis of current science, technology, engineering and mathematics (STEM) education research by analyzing articles in eight journals focusing on STEM disciplines. [3] Analyzed the publications of practitioners and researchers in order to determine the scope of current research on STEM education, the locations where current STEM education research is being conducted, and the scope of current STEM education research.

The publications of practitioners and researchers were analyzed to determine the scope of current STEM education research, where current STEM education research is conducted, and who is involved in current STEM education research . Articles were selected from eight journals based on what the original authors had to say about STEM education in their articles.

The findings of this paper summarize the frequency of different research methods used in STEM education, the outcomes of STEM education research, the participants in STEM education research, and the universities involved in STEM education research. [4]

Domestic literature on STEM education-related journals has been increasing since 2010 , and research on STEM education has never been interrupted from 2010 to 2023, and the overall number has been on an upward trend. As Fig 1., in 2019, the number of STEM education-related literature published in CSSCI has reached 109 articles of the top.

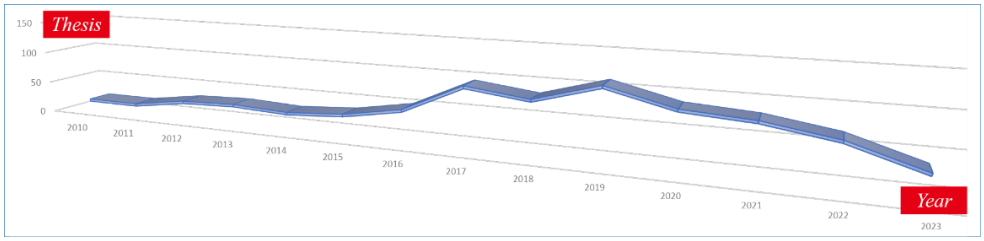

Fig. 1. CSSCI STEM Education Thesis Statistics.

3 Stem education combined with AIGC correlation

Through STEM education, AIGC, it is possible to reform the problem of insufficient technology content in traditional liberal arts, and the following goals can be achieved by reforming the curriculum with the theme of new media classes and integrating the content of STEM education:

3.1 Cultivating comprehensive thinking skills

STEM education focuses on problem solving and innovative thinking, skills that are also applicable to the humanities. [5] By fostering critical thinking, logical thinking, and creativity, students will be able to flexibly utilize these skills to solve different types of problems, such as filming in extreme environments with too much darkness and light, and special account operations.

3.2 Strengthening the goal of scientific experimental teaching methods

In Fig 2, combining the experimental and exploratory characteristics of STEM education, introducing more project-based learning and practical activities can enable students to better understand and apply what they have learned in practice, encourage students to carry out innovative research and creative expression in the field of liberal arts, and cultivate their independent thinking and creativity, such as the past new media courses of the number of the process of the same, to be able to find out the new operation methods and algorithms, and to experiment with a variety of results. [6]

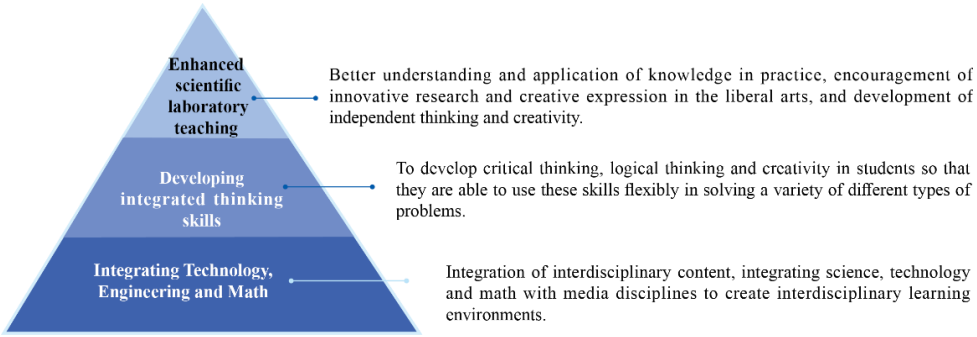

Fig. 2. STEM Education and New Media Teaching Levels.

The STEM education feature strengthens the New Arts' ability in technology and big data, and introduces a variety of new tools for curriculum application in the new media courses. For example, the use of "newrank" big data tool payment service, ChatGPT artificial intelligence tool, AIGC technology, so that the classroom content and the latest technology to enhance interactivity, and then use its big data collection methods, so that students use big data tools to explore the results, to be able to show the results of learning. [7] In fig 3., the new direction of applying information technology in new media teaching and enhancing the relevance of classroom.

Science: Introducing the Logic of Thesis. Each design creation and report should be in line with the scientific nature, from literature review to complete theoretical framework, each semester's final report or design should have its scientific nature, in line with the scientific way of thinking.

Technology: Introducing Big Data Services. New media courses have many big data services now, that can provide instant public opinion, live streaming data, the number of products, and other types of data, and each course needs to use data software to collect data so that students can get used to the idea of changing from "writing essays" to "writing theses," and to create from user images and other data-oriented ideas. Students will be able to create their own work from user images and other data.

Engineering: Artificial Intelligence Generation. Artificial Intelligence is a trend nowadays, and it is especially important for the media discipline. The introduction of Artificial Intelligence Generation in the course will make creation easier, but it will also make creation more in line with the needs, and coursework must use AIGC technology, which is in line with engineering thinking.

Mathematics: Introducing Statistical Perspective. New media data services have many collection techniques, but the final interpretation still has to have statistical connotations, through the introduction of statistical content, the interpretation of new media data, the final report must be analyzed using a statistical point of view, but also to make the report of the liberal arts more scientific.

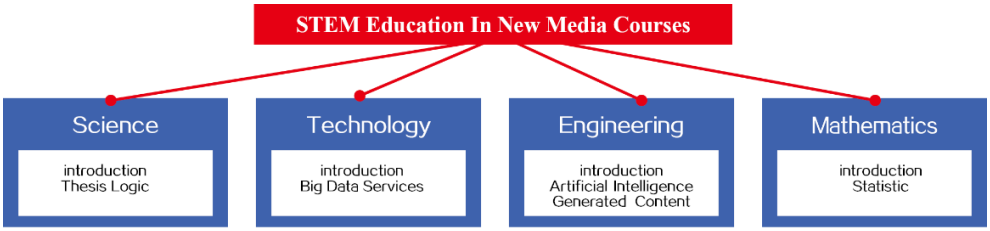

Fig. 3. STEM education in teaching new media diagram.

New media courses add STEM education thinking and AIGC content generation, the final design must be combined with Science, Technology, Engineering, and Mathematics standards, and must be created in conjunction with AIGC content generation to promote the intersection of culture and technology, and by understanding needs of humanistic realms, students are able to develop more humane and socially meaningful applications that enable technology to better serve society.

4 Research of STEM education model survey

The Department of Network and New Media is part of the Media Studies, which teaches many new technologies and brings new educational concepts and content to students through the STEM education model. This approach allows students to keep up with times and gain new perspectives and skills while studying traditional subjects. [8]

A survey of 64 students enrolled in Department of Network and New Media in the 2023 class was conducted to obtain feedback through a questionnaire on the relevance of the Graphics and Image Processing course of STEM education. 64 students were given a total of 2 credits, 8 weeks, and 1,440 minutes of training in STEM education, and questionnaire data were obtained, with the margin of error being the standard deviation of the P of the sample proportions times 1.96, which is approximately plus/minus 2%.

As Fig 4., in the question "Does Artificial Intelligence Generated Content Help Science?" questionnaire, 38.71% thought that it very much increased science and 35.48% thought that it did, which shows that AIGC is helpful for science and can enhance students' help in thinking scientifically.

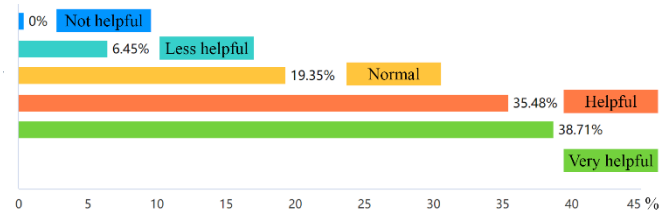

Fig. 4. AIGC's Helpful on "Science" Survey.

In Fig 5., the question "Does Artificial Intelligence Generated Content Help Technology?" It's also 35.48% feel very helpful, 38.71% think helpful. It shows that 74.19% of the students are

very positive about the help of AIGC in the course, and they are very positive about the effect of technology on the learning of the students of the Department of New Media, who are able to construct the effect and gain the knowledge related to technology.

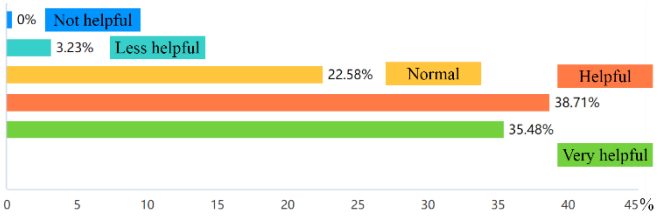

Fig. 5. AIGC's Helpful on "Technology" Survey

Through Fig 6., the question "Does Artificial Intelligence Generated Content Help Engineering?" Still as many as 41.94% of the students thought it was helpful and 25.81% felt it was helpful. AIGC can provide fast picture generation technology in the engineering field, so that students can have a pioneer thinking when using AIGC to make engineering drawings. Maybe the pictures can not be used directly, but the step-by-step approach can still save the time of the project.

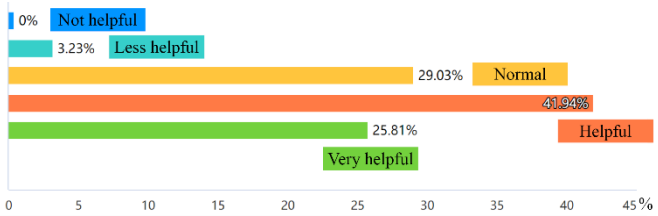

Fig. 6. AIGC's Helpful on "Engineering" Survey

Last Question in Fig 7., "Does Artificial Intelligence Generated Content Help Mathematics?" In fig 6., this result is very interesting, 41.94% of the students found it useful and 25.81% found it very useful. In fact, AIGC is not very helpful to mathematics, probably due to the error of the questionnaire or students' misunderstanding with AIGC when using big data in the curriculum, but it is obvious that as many as 29.3% of the students found it generally useful or not useful, which is also a relatively high figure in the relative statistics.

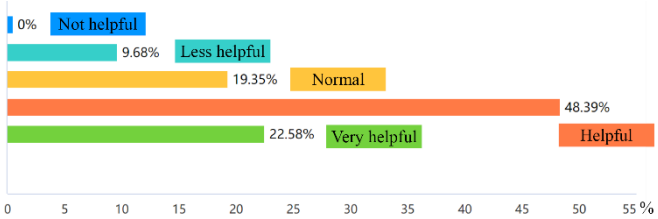

Fig. 7. AIGC's Helpful on "Mathematics" Survey

Overall, STEM education is a new experience for students in the New Media Department. Through the learning of science, technology, engineering, and mathematics, students can gain

new insights, especially since today's liberal arts students are less likely to use new technologies, and STEM education should be used as a conduit to equip students with new thinking and technological skills.

The questionnaire survey may be affected by Primacy Effect, Recency Effect, and Context Effect, which can be re-utilized in a more professional way, but the validity has a certain degree of credibility because of the census approach adopted in the sampling process.

5 Conclusions

Motivation is the energy that inspires, sustains and directs behavior toward a goal. Psychologists generally define motivation as an internal process that stimulates, directs and sustains behavior over time. [9] Motivation can be viewed as a personal trait, a temporary state, or a combination of both. Motivation leads to persistence, direction, and planning in learning, all of which are favorable conditions for learning, and STEM education is one way to enhance motivation.

In Department of Network and New Media, STEM Education provide the technical skills necessary for new media. Understanding technology, coding, data analysis, and engineering principles allows students to navigate and innovate within the digital landscape effectively. It fosters problem-solving and critical thinking abilities. When applied to new media, this helps students develop innovative approaches to content creation, user experience design, and the integration of emerging technologies.

New media often involves collaborative projects that require diverse skill sets. STEM education encourages interdisciplinary collaboration, enabling individuals from different backgrounds to work together seamlessly. [10] The digital landscape evolves rapidly, STEM education equips students with a foundational understanding of technology, making them adaptable to new tools and platforms as they emerge.

STEM education encourages a problem-solving mindset. When applied to new media, this mindset allows students to address real-world issues through digital storytelling, data visualization, or interactive platforms. STEM knowledge enables students to explore and integrate emerging technologies like artificial intelligence, virtual reality, or augmented reality into their new media creations, enhancing engagement and user experience.

This research mainly explores the connection between the Department of Internet and New Media and SETM education, how to help students and teachers to grow in the curriculum through the introduction of new technology, out of the past mode of unidirectional dissemination and into a more efficient modern technology. It has been proved that STEM education is of great help to liberal arts students, and it is worthwhile to continue to follow up the research.

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References

[1] Tytler, R. (2020). STEM education for the twenty-first century. Integrated approaches to STEM education: An international perspective, 21-43.
[2] Xie, Y., Fang, M., & Shauman, K. (2015). STEM education. Annual review of sociology, 41, 331-357.
[3] Brown, J. (2012). The current status of STEM education research. Journal of STEM Education: Innovations and Research, 13(5).
[4] Kennedy, T. J., & Odell, M. R. (2014). Engaging students in STEM education. Science education international, 25(3), 246-258.
[5] Wang Lu. (2021). A review of domestic STEM education research based on Citespace. Journal of Heilongjiang Ecological Engineering Vocational College(01),90-92.
[6] Shen, C. C., Wang, Y. M., & Wu, J. (2021, December). New Media in Film Communication and Cultural Industry with happiness detection. In 2021 9th International Conference on Orange Technology (ICOT) (pp. 1-4). IEEE.
[7] Mo, J., Kang, X., Hu, Z. I. Y. U. A. N., ZHou, H., Li, T., & GU, X. (2023). Towards Trustworthy Digital Media In The Aigc Era: An Introduction To The Upcoming IsoJpegTrust Standard. IEEE Communications Standards Magazine, 7(4), 2-5.
[8] Shen, C. C., Wang, Y. M., Wu, J., Meng, F. D., & Shou, T. W. (2022, November). Teaching effect of interactive response system in new media courses. In 2022 10th International Conference on Orange Technology (ICOT) (pp. 1-4). IEEE.
[9] Ortiz-Revilla, J., Adúriz-Bravo, A., & Greca, I. M. (2020). A framework for epistemological discussion on integrated STEM education. Science & Education, 29(4), 857-880.
[10] Qureshi, A., & Qureshi, N. (2021). Challenges and issues of STEM education. Advances in Mobile Learning Educational Research, 1(2), 146-161.