Journal of Social Science Humanities and Literature, Vol.8, Issue 4, (Apr)
ISSN 2277-842X **2025**
DOI: 10.53469/jsshl.2025.08(04).10

Perception and Practice: Exploring STEAM Literacy and Creative Thinking Among Private University Instructors in Shanghai

Yiwei Li[1], Chaoran Li[2,*]

[1]Shanghai Zhongqiao Vocational and Technical University, Shanghai, China
[2]Shanghai Jianqiao University, Shanghai, China
**Correspondence Author*

Abstract: ***Among the instructors of a private university in Shanghai, this study examines their perceptions of STEAM literacy and creative thinking as well as their applications. In order to understand the views of instructors from 15 colleges regarding STEAM literacy and creative thinking, the study uses explanatory sequential design, which is one of the mixed method research designs. The study identifies the relevance of STEAM literacy in the university education system by conducting survey follow-up interviews in order to obtain a deeper understanding of these perceptions and practical applications. Furthermore, it examines how STEAM literacy and creative thinking interact, revealing the potential for interdisciplinary and creative learning in higher education as a whole. These findings can be used to inform future pedagogical practices and educational reforms in higher education.***

Keywords: STEAM Literacy; Creative Thinking; Private University Instructors.

1. INTRODUCTION

It is imperative for 21st century learners to develop interdisciplinary knowledge, skills, and literacy, given the rapidly evolving societal and technological landscapes (Aguilera & Ortiz-Revilla, 2021). STEAM encourages students to integrate multiple disciplines into a comprehensive learning experience through the use of a pedagogical paradigm centered on Science, Technology, Engineering, Arts, and Mathematics (STEAM) (Aguilera & Ortiz-Revilla, 2021). Similarly, higher education has long been recognized as a vital component of developing creative thinking skills, which enable students to solve problems from new perspectives.

The complex interplay between STEAM literacy and creative thinking remains understudied, particularly within the context of Chinese higher education. The purpose of this study is to explore the perceptions and applications of STEAM literacy and creative thinking by private college instructors.

This study employs a sequential explanatory design that utilizes mixed methods to assess instructors' perceptions and applications using a survey as the first step. In order to gain a more nuanced understanding of the challenges and practices associated with STEAM literacy and creative thinking, qualitative semistructured interviews will be conducted to further elaborate these findings.

It is intended that this research will contribute to the ongoing discourse on interdisciplinary pedagogy and creative thinking in higher education, thereby providing valuable insights into future educational strategies and policies. Educators and policymakers who wish to effectively incorporate STEAM education and creative thinking into their institutions may find the findings of this study particularly beneficial, thereby preparing students for the 21st century workforce with the skills and literacies needed to succeed.

2. INTERPLAY

2.1 The Importance of STEAM Literacy in Higher Education

2.1.1 STEAM Education and Engagement

Research has shown that Enhancing student engagement and functional literacy: STEAM education can improve student engagement and help students improve functional literacy across the curriculum (Long & Davis, 2017). It equips students with essential skills for problem-solving, understanding information, and evidence-based decision

making (Chalmers et al, 2017).

2.1.2 From STEM to STEAM

By integrating the arts and languages of arts into STEM disciplines, it is meant to encompass some or all of the following disciplines: historical, sociological, physico-cultural and linguistic (Yakman, 2010). With STEM disciplines focusing on the development of logical, objective, and analytical skills among learners, adding A to STEM may invite disciplines that focus on the development of subjectivity, intuition, sensation, and playful thinking in learners (Sousa & Pilecki, 2013 & Yakman, 2010). Consequently, by moving from STEM to STEAM, students are provided with the opportunity to diverge between the nature of the disciplines integrated into educational practice, thereby increasing their creative thinking and problem solving capabilities (Land, 2013; Gettings, 2016; ElSayary, 2021).

2.1.3 Interdisciplinary Cultivation

In an era characterized by swift societal progression and ceaseless evolution of knowledge production methodologies, the conventional, single-discipline educational approach proves insufficient in satisfying the demands of societal development and the intricate necessities of scientific and technological innovation. Consequently, a transition from single-discipline to interdisciplinary educational models has become an overarching trend within higher education institutions (Xiong & Hu, 2017). Interdisciplinary education, the focal point of this reformative trajectory, aims to cultivate a broad knowledge structure, interdisciplinary thinking abilities, and comprehensive literacy in students to prepare them for practical problem-solving through interdisciplinary learning (Wang, 2016).

STEAM pedagogy, a transdisciplinary approach, seamlessly amalgamates aesthetics and design pedagogies to enhance STEM disciplines (Keane & Keane, 2016). Lavicza et al. (2018) proposed that phenomenon-based learning could provide new avenues for STEAM education through transdisciplinary, skill-oriented, and collaborative learning. As a result, students are equipped with the capacity for cross-disciplinary reasoning, which empowers them to alter their perspectives and flexibility, thereby identifying and addressing issues in a transdisciplinary manner (Donald, 2009).

Existing research on interdisciplinary projects in China primarily concentrates on two aspects: learning from experiences and theoretical exploration. With regard to learning from experiences, advanced foreign methodologies in interdisciplinary talent development have been summarized through case studies of reputable institutions such as Princeton University, University of Michigan, and University of California, Berkeley (Fu &Xia, 2020). Theoretical exploration, on the other hand, has been extensively conducted on the teaching design, organization, core teaching elements, and cooperative forms of interdisciplinary project learning in basic education (Qin & Fu, 2017). In summary, the current model of interdisciplinary project learning in Chinese higher education is exploratory, with research on interdisciplinary project learning at the higher education level remaining relatively underdeveloped.

2.2 The Role of Creative Thinking in Higher Education

The capacity to perceive problems from a unique angle and generate innovative or unconventional solutions is an indispensable skill for university students. However, it appears that the value of creativity is often underestimated in several disciplines taught in English universities (Fryer, 2007). Notably, academic projects and educational curricula for instructors seldom incorporate activities that promote creativity and methods to foster such abilities in students (Lima & Alencar, 2014; Oliveira & Alencar, 2014; Martnez, 2002).

Research by Lima and Alencar (2014) and Oliveira and Alencar (2014) reveal congruent findings, highlighting that a creative thinker typically exhibits an exceptional ability to transcend conventional barriers. Such an individual is characterized by an innate curiosity, optimistic disposition, and a robustly imaginative mindset. These traits underscore the significance of nurturing creativity as an essential facet of holistic education.

2.3 The Interplay between STEAM Literacy and Creative Thinking

STEAM education, a broadening of the traditional STEM framework to encompass the Arts, is a comprehensive, multidisciplinary methodology that amalgamates science, technology, engineering, arts, and mathematics. This

innovative approach encourages cross-disciplinary learning, dismantling the traditional compartmentalization of academic disciplines to foster creative problem-solving (Aguilera & Ortiz-Revilla, 2021). As research suggests, adopting such a methodology enhances creativity, critical thinking, and the capacity for collaborative work, skills that are in high demand in the contemporary workforce (Honey, Pearson & Schweingruber, 2014). Furthermore, interdisciplinary STEAM education has been associated with heightened student engagement and retention, particularly within STEM fields, by rendering the learning process more engaging and enjoyable (Quigley & Herro, 2016).

3. METHODOLOGY

This study employed a mixed-methods sequential explanatory design (Creswell & Clark, 2017), where qualitative data is used to interpret and further elucidate the results of quantitative data. In this mixed approach, key findings from qualitative data used to interpret and examine the results of quantitative data (Creswell &Clark, 2017). The participants in this survey were 182 teachers from 15 different colleges at a private undergraduate university in the suburbs of Shanghai (Table 1). Semi-structured interviews were conducted with 10 teachers selected from these participants based on characteristics. Our primary objective was to examine the perceptions, and applications of creative thinking/STEAM literacy from private college instructors (Weisberg et al., 1996). A questionnaire contained the following items which directly addressed the analysis structure for this study: (1) perceptions of STEAM literacy by college teachers; (2) perceptions of creative thinking skills by college instructors; and (3) demographic characteristics of college instructors. To report Cohen's alpha effect size, paired t-tests were used in addition to background information, which was derived using Likert scales (1-5). Further, the structure in the interview protocol includes The structure in the interview protocol includes (1) understanding of steam literacy and creative thinking (2) practices related to steam literacy and creative thinking, and (3) challenges of steam literacy and creative thinking. The structure in the interview protocol includes (1) understanding of steam literacy and creative thinking (2) practices related to steam literacy and creative thinking (3) challenges of steam literacy and creative thinking. In order to protect the identity of the participants, transcribed recordings of the interviews were used as a basis for the content analysis.

4. PRELIMINARY RESULTS

This section reports three key findings from survey and interviews. These findings shows the perspective of instructors' who Shanghai private university in STEAM literacy and creative thinking, we also found the view of the training of STEAM from instructors.

Table 1 presents the demographic proportions of this study. Briefly, out of the 182 teachers, about 38.7% were male instructors and there were more female instructors than male instructors at about 61.3%; in terms of educational background, the percentage of doctoral degree was 25.8%, master's degree was the highest at 63.4%, and bachelor's degree was 10.8%. In terms of titles, assistant professors accounted for about 16.1%, lecturers accounted for the highest share of about 57%, 23.7% were associate professors, and professors accounted for 3.2%; in terms of teaching experience, about 37.6% of the teachers had been teaching for 6 to 10 years, and 11.8% had been teaching for 11 to 15 years.

The first finding is that based on demographic data, a t-test and one-way ANOVA test showed that there was no significant difference in instructors' perceptions of STEAM literacy and creative thinking. In terms of STEAM literacy and creative thinking, we were surprised to find that instructors at different colleges showed no statistically significant difference ($f = 0.657$, $p = 0.774$; $f = 0.459$ $p = 0.923$), whether they were STEAM majors or non-STEAM majors (Table 2).Through the interviews, we found that although the position of China's private universities is to cultivate application-oriented students, instructors pointed out that students in private universities need to understand STEAM literacy and creative thinking, and instructors with the titles of associate professor and professor mentioned the need for students to be exposed to their methodologies. Some instructors also mentioned that "STEAM literacy is more applied, while creative thinking is more abstract". Instructors rarely incorporate activities and methods to promote creative thinking in their own work (Lima & Alencar, 2014; Oliveira & Alencar, 2014; Martnez, 2002), because almost all of the instructors did not know how to integrate STEAM literacy and creative thinking into their teaching, and some did not know if their applications utilized STEAM literacy and creative thinking.

Table 1: Description of sample

		% of sample
Gender	Male	38.7
	Female	61.3
Educational Background	Bachelor	10.8
	Master	63.4
	Doctor	25.8
Job Type	Full time	90.3
	Part time	9.7
Professional Titles	Assistant	16.1
	Lecturer	57
	Associate professor	23.7
	Professor	3.2
Course Type	Theoretical courses	47.3
	Practical courses	52.7
Work Year	under 5 years	29
	6-10 years	37.6
	11-15 years	11.8

Table 2: One-way ANOVA test

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
STEAM_Literacy	Between Groups	7.537	11	0.685	0.657	0.774
	Within Groups	84.463	81	1.043		
	Total	92	92			
Creative_Thinking	Between Groups	5.4	11	0.491	0.459	0.923
	Within Groups	86.6	81	1.069		

The second finding was that the relationship between STEAM literacy, and creative thinking by instructors, was investigated using Pearson's product-moment correlation coefficient. There was a strong, positive correlation between the two variables ($r^2 = .651$, $n = 186$, $p < .001$), with high levels of perceptions from the STEAM literacy associated with high levels of creative thinking (Table 2). According to some instructors, STEAM literacy serves as the basis for creative thinking; others believe that STEAM literacy and creativity are mutually reinforcing, and that creative thinking is influenced and supported by STEAM literacy (Honey, Pearson & Schweingruber, 2014). According to some instructors, STEAM literacy and creative thinking should be developed in parallel so that students can reap the benefits of both. However, most of the instructors thought that it was difficult to put creative thinking into practice. Some instructors reported that "Creative thinking is a continuous process that needs to be accumulated," and some instructors mentioned that "there is a lack of evaluation system for creative thinking in Chinese private universities".

Table 3: correlation

Correlations

		STEAM_Literacy	Creative_Thinking
STEAM_Literacy	Pearson Correlation	1	.651**
	Sig. (2-tailed)		0
Creative_Thinking	Pearson Correlation	.651**	1
	Sig. (2-tailed)	0	
	N	186	186

As for the third finding, most instructors did not receive support and training in STEAM literacy or creative thinking from universities or society, but rather gained their knowledge through their own independent study. A number of instructors highlighted the challenges facing the university during the interviews: different foundations between teachers and students, limited classroom teaching time, difficulty in promoting STEAM literacy and creative thinking for some students, and a lack of support for hardware and equipment and relevant policy. Some senior instructors expressed concern regarding the difficulty of learning new knowledge.

5. SCHOLARLY SIGNIFICANCE

Private universities in China have a unique position and cultural environment, and they also require STEAM literacy and creative thinking in order to cultivate talent that can cope with the fast-changing social and technological environment (Aguilera & Ortiz-Revilla, 2021). Accordingly, this study contributes to the recognition and application of STEAM literacy and creative thinking at the instructor level, as well as serving as a reference for the support of universities, the development of university climates, and top-level policy development. There is a strong tendency for the university to be a place of exploration and experimentation, and we are hopeful that this study will contribute to the discussion regarding STEAM literacy, application, talent development, and policy in private universities in China.

REFERENCES

[1] Aguilera D, Ortiz-Revilla J. (2021). STEM vs. STEAM Education and Student Creativity: A Systematic Literature Review. *Education Sciences. 11(7)*:331. https://doi.org/10.3390/educsci11070331
[2] Aguilera, D., & Ortiz-Revilla, J. (2021). STEM vs. STEAM education and student creativity: A systematic literature review. *Education Sciences, 11(7)*, 331. https://doi.org/10.3390/educsci11070331
[3] Chalmers, C., Carter, M., Cooper, T., & Nason, R. (2017). Implementing "big ideas" to advance the teaching and learning of science, technology, engineering, and mathematics (STEM). *International Journal of Science and Mathematics Education, 15*, 25-43. https://doi.org/10.1007/s10763-017-9799-1
[4] Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Sage publications.
[5] De Alencar, E. M. L. S., & De Oliveira, Z. M. F. (2016). Creativity in Higher Education According to Graduate Programs' Professors. *Universal journal of educational research*, *4*(3), 555-560. https://doi.org/10.13189/ujer.2016.040312
[6] Donald, J. G. (2009). The commons: Disciplinary and interdisciplinary encounters. In C. Kreber (Ed.), *The university and its disciplines: Teaching and learning within and beyond disciplinary boundaries* (pp. 35–49). Routledg.
[7] El Bedewy, S., & Lavicza, Z. (2023). STEAM+ X-Extending the transdisciplinary of STEAM-based educational approaches: A theoretical contribution. *Thinking Skills and Creativity*, *48*, 101299. https://doi.org/10.1016/j.tsc.2023.101299
[8] ElSayary, A. (2021). Designing and teaching transdisciplinary STEAM curriculum using authentic assessment in online learning. *Journal of Turkish Science Education*, *18*(3), 493-511. https://doi.org/10.36681/tused.2021.86
[9] Fryer, M. (2007). Facilitating creativity in higher education: A brief account of National Teaching Fellows' views. In N. Jackson, M. Oliver, M. Shaw, & J. Wisdom (Eds.), *Developing creativity in higher education* (pp. 74-88). London: Routledge.
[10] Fu, S., & Xia,F.Q. (2020). 跨学科项目式学习的现状及改进策略[Current Situation and Improvement Strategies of Interdisciplinary Project-Based Learning]. *Modern Primary and Secondary Education, (11)*, 21-25.
[11] Gettings, M. (2016). Putting it all together: STEAM, PBL, scientific method, and the studio habits of mind. *Art Education*, 69(4), 10-11. https://doi.org/10.1080/00043125.2016.1176472
[12] Honey, M., Pearson, G., & Schweingruber, H. (2014). National Academy of Engineering and National Research Council (2014) (Eds.). *STEM integration in K-12 education: Status, prospects, and an agenda for research*. National Academies Press. https://doi.org/10, 18612. https://doi.org/10.48550/arXiv.1703.09643
[13] Keane, L., & Keane, M. (2016). STEAM by Design. *Design and Technology Education*, *21*(1), 61-82.
[14] Land, M. H. (2013). Full STEAM ahead: The benefits of integrating the arts into STEM. *Procedia Computer Science, 20*, 547-552. https://doi.org/10.1016/j.procs.2013.09.317
[15] Lattuca, L. R. (2001). *Creating interdisciplinarity: Interdisciplinary research and teaching among college and university faculty*. Vanderbilt university press.
[16] Lavicza, Z., Fenyvesi, K., Lieban, D., Park, H., Hohenwarter, M., Mantecon, J. D., & Prodromou, T. (2018). In East Asia Regional Conference on Mathematics Education [Conference]. National Taiwan Normal University.Taiwan, China.
[17] Lima, V. B. F., & Alencar, E. M. L. S. (2014). Creativity in graduate programs in education: Pedagogical practices and inhibiting factors. *Revista Psico USF*, *19*(1), 61-72. https://doi.org/10.1590/S1413-82712014000100007
[18] Long II, R. L., & Davis, S. S. (2017). Using STEAM to increase engagement and literacy across disciplines. *The STEAM Journal*, *3*(1), 7. https://doi.org/10.5642/steam.20170301.07
[19] Martínez, A. M. (2002). Creativity in school: Three work directions. Linhas Críticas, 8(15), 189-206

[20] Morais, M. D. F., Almeida, L. S., Azevedo, I., Alencar, E. M. L. S. D., & Fleith, D. D. S. (2014). Portuguese validation of the Teaching Practices for Creativity in Higher Education Inventory. *Avaliação Psicológica*, *13*(2), 167-175.
[21] Qin, J.R & Fu, G.S. (2017). STEM 教育：基于真实问题情景的跨学科式教育[STEM Education: Interdisciplinary Education Based on Real Problem Scenarios]. *China Electronic Education,(04)*, 67-74.
[22] Quigley, C. F., & Herro, D. (2016). "Finding the joy in the unknown": Implementation of STEAM teaching practices in middle school science and math classrooms. *Journal of Science Education and Technology, 25*, 410-426. https://doi.org/10.1007/s10956-016-9602-z
[23] Sousa, D. A., & Pilecki, T. (2013). *From STEM to STEAM: Using brain-compatible strategies to integrate the arts*. Corwin Press.
[24] Wang,Y.X. (2016). 跨学科教育：我国大学创建一流本科教学的必由之路——以环境类本科教学为例[Interdisciplinary education: a necessary way to create first-class undergraduate teaching in Chinese universities--an example of environmental undergraduate teaching]. *China Higher Education Research,(06)*, 17-24.
[25] Weisberg, H., Krosnick, J. A., & Bowen, B. D. (1996). *An introduction to survey research, polling, and data analysis*. Sage.
[26] Xing, B., & Marwala, T. (2017). Implications of the fourth industrial age on higher education. *arXiv preprint arXiv:1703*.09643.
[27] Xiong, Y.Q., & Hu, J. (2021). 研究生创新创业素质与学科交叉培养模式——基于在校研究生的调查与分析[Innovative and Entrepreneurial Qualities of Graduate Students and Interdisciplinary Cultivation Models - A Survey and Analysis Based on Current Graduate Students]. *Journal of Graduate Education, (02)*, 40–46. https://doi:10.3969/j.issn.2095-1663.2017.02.008
[28] Yakman, G. (2010). What is the point of STE@M?–A Brief Overview. Steam: A Framework for Teaching Across the Disciplines. *STEAM Education*, *7*(9), 1-9.