

International Journal on Multidisciplinary and Applied Research<https://doi.org/10.63236/ijmar.2.1.1>

Date received: 22/03/26; revised: 28/05/26; accepted: 24/06/26; published: 30/06/26

Design Principles for Critical and Creative Thinking in Teacher Professional Development: A Continued Design Narrative across K-12 and Higher Education Contexts**Jing Wu**

National Institute of Education,
Nanyang Technological University,
Singapore
<https://orcid.org/0000-0003-2079-2642>

Corresponding Author: Jing Wu, jing.wu@nie.edu.sg**Abstract**

Critical and creative thinking are key competencies emphasised in Singapore's 21st century competencies and several international educational policies and guidelines. While there is consensus among various educational stakeholders on developing these competencies in students, research shows that K-12 teachers are often uncertain about what these competencies entail and how to foster them in the classroom. This paper addresses the teacher readiness issue by building on the author's work in the K-12 context and extending the continued design narrative in the higher education context. It documents and justifies the design for critical and creative thinking in a teacher professional development course. Design principles of MASTER (Multiplexity in Making, Agency, Space, Transformative Thinking, Embodied Experience, and Reflection) are proposed and elaborated on, and learning activities are introduced. Implications for future study are discussed from three aspects: teachers as critical and creative beings, agentive beings, and relational beings. This paper hopes to shed light on teacher development, specifically the development of these thinking skills.

Keywords: critical thinking, creative thinking, teacher professional development.**1. Introduction**

In an era defined by growing complexity and uncertainty, critical and creative thinking have become indispensable competencies for navigating contemporary society. Such competencies encompass both the rigorous application of intellectual standards, reflective assessment of one's own thinking, and the inventive creation of ideas (Paul & Elder, 2002; Romero, 2026). For the purpose of this paper, critical and creative thinking are understood as two inseparable dimensions of purposeful reasoning. Critical thinking, following Paul and Elder (2006, 2008), refers to a

systematic and purposeful form of thinking comprising three interrelated components: the elements of reasoning such as purpose and question at hand; universal intellectual standards such as clarity, precision, and relevance applied to evaluate the quality of reasoning; and intellectual traits such as intellectual curiosity and integrity that develop through their consistent application. Reasoning is itself a creative act, a "new making", whereby creative thinking is not a mysterious talent belonging to a few, but the creation and re-creation of understanding through a process of figuring and reasoning (Paul & Elder, 2008). As an OECD 2019 report on critical and creative thinking found (Vincent-Lancrin, 2019), criticality enables one to maintain clarity of mind in a digital world with competing views and assumptions, while creativity triggers a lasting positive psychological state. Critical and creative thinking are reflected in several national policies. For example, they are embedded in the Australian curriculum as core capabilities, through which young Australians are equipped for lifelong learning and participation (ACARA, n.d.). They are also identified by the Singapore Ministry of Education (MOE, n.d.) as the emerging 21st-century competencies for thriving in the changing landscape. The development of critical and creative thinking is increasingly foregrounded in future-ready educational discourse.

There is broad stakeholder consensus among researchers, policymakers, school leaders, and teachers on developing students' critical and creative thinking in explicit and sustainable ways (Fullan et al., 2018; Paul & Elder, 2008; Retna, 2007). This consensus is well-founded: critical thinking capabilities do not emerge naturally from traditional disciplinary instruction; rather, explicit teaching of thinking has been shown to be both necessary and more effective than leaving it to implicit, incidental approaches (Abrami et al., 2008). Yet despite this agreement, research consistently reveals that many teachers remain inadequately prepared to translate this into classroom practice (Leibovitch et al., 2025; Seman et al., 2017; Vincent-Lancrin, 2019). Leibovitch et al. (2025) synthesised this concern, noting that teachers tend to hold a partial conception of critical thinking, lack the pedagogical knowledge and skills needed to foster it, and carry deeply entrenched beliefs about teaching and learning that sit in tension with the very approaches that support it.

This gap is not merely theoretical. Empirical studies consistently confirm its existence. An earlier study of primary school teachers in Singapore (Wu, 2020) found that despite their genuine willingness to develop students' critical and creative thinking, many teachers were uncertain about what these skills entailed and how to teach them effectively. Such unpreparedness carries serious consequences: it undermines implementation efforts (Vincent-Lancrin, 2019), and pushes teachers back toward conventional, lecture-based instruction (Agusta & Noorhapizah, 2020), approaches widely recognised as insufficient for building students' critical and creative thinking capacities.

The urgency of addressing this gap cannot be overstated. Equipping teachers with the knowledge, skills, and confidence to teach and facilitate critical and creative thinking explicitly is a professional imperative, not an option. Both Leibovitch et al. (2025) and

Terblanche et al. (2025) underscore this, calling for sustained, focused professional learning that builds teachers' capacity to teach critical thinking effectively. Addressing this imperative, the present study extends the author's earlier empirical work on critical and creative thinking in K-12 contexts (Wu, 2020) by exploring its application within a higher education teacher professional development course. Specifically, it reviews and reports on the tested and refined design principles in the empirical study. It then situates the design within the teacher professional learning context guided by the question: "What are the characteristics of a professional learning course that develops the teachers in the teaching of critical and creative thinking?" Informed by the relevant literature and the author's practice, the design principles are refined; activity outlines are proposed and discussed, followed by a broad discussion of implications for teacher professional learning and teacher development.

This paper makes three important contributions to the existing research on teacher education, each addressing a gap that has remained underexplored in the literature. First, while most research studies focus on students' development of critical and creative thinking (Akpur, 2020) or at most, teachers' conceptual understanding and classroom implementation of these skills (Newton & Newton, 2010), the current study takes a different focus on teachers' own experiential learning of critical and creative thinking within a professional development course. Rather than examining what teachers know or how they teach, it foregrounds how teachers themselves experience learning to think critically and creatively. Such a focus directly addresses the concern raised by researchers (Bedir, 2019; Leibovitch et al., 2025), namely that many teachers lack firsthand experience in the collaborative, thinking-intensive activities they are expected to facilitate, a gap that the authors argue can only be meaningfully bridged through embodied experience, which is both necessary and strategic.

Second, while most studies privilege outcomes over process by measuring whether critical and creative thinking skills have improved, this paper foregrounds the design process itself: how relevant learning experiences are initiated and developed, how they are implemented and refined, and what is achieved along the way toward desired outcomes. Such process-oriented documentation offers learning designers, whether teacher educators or classroom teachers, a rare insight into the often opaque decisions and deliberations of design, enabling them to exercise informed professional judgement in adapting the design to their own contexts. Third, rather than recommending strategies and approaches with little information on their underpinning principles, this paper proposes explicit design principles and examines how they can be instantiated as corresponding learning activities. In doing so, it offers a principled and adaptable framework that invites further exploration, adaptation, and testing across new contexts.

The paper is structured as follows. Design narratives, as a methodological form, relate the stories of how complex artefacts are developed and used in practice, and subsequently altered by users and designers to fit new purposes (Hoadley, 2002; Mor, 2011). Adopting this approach, this paper traces the retrospective analysis of design

principles developed in a prior K-12 study and their prospective reconceptualisation for a higher education teacher professional development context, making visible the design reasoning, conjectures, and deliberations that inform each stage of the process. The next section elaborates on the findings of the prior empirical study that inform the current design. Drawing on the relevant literature and the author's practice, the refined design principles and corresponding activity outlines are then presented and discussed. The paper concludes with implications for teacher professional learning and directions for future research.

2. The Original Design Context (K-12)

This section reports on the prior K-12 study, including a detailed elaboration of its context, its theoretical groundings, the initial and refined design principles (DPs) and the learning activities informed by these principles, and finally, implications for the current context. For the purpose of this paper, the focus is on the learning design. Readers who are interested in the learning outcomes may refer to the complete report of this study (Wu, 2020).

2.1 Developing Critical Thinking in Character Education through Education Digital Storytelling

The setting for the study is two Primary 5 Character Education classes (Cycle 1: 15 students and Cycle 2: 21 students) from a Singaporean government-aided school. The central concern for the prior K-12 study was a well-documented pedagogical gap: despite the Character Education programme's emphasis on developing students' critical thinking, identity, relationships, and value-guided decision-making, teachers predominantly relied on transmissive, teacher-centred instruction that left little space for students to think critically, exercise agency, or make reasoned choices (Kanagaratnam, 2015; Althof & Berkowitz, 2006). Moreover, the author observed that the prevailing Character Education approach is dominantly text-based, emphasizing reading the textbook and writing the answers without leveraging the multimodality of learning and the pedagogical affordances of technology for more experiential, student-centred learning to develop critical and creative thinking.

Educational Digital Storytelling (EDS), the facilitated production of short, narrated films in an educational setting, was introduced as a process-based, learner-centred response to these challenges, engaging students through visual, oral, kinetic, and aural modes of meaning-making and developing critical and creative thinking through dialogic inquiry and reflection (De Jager et al., 2017; Lambert, 2013; New London Group, 1996). The purpose of the project was to help students develop their identity, build relationships, and develop critical thinking to evaluate and inform their value-based choices. It was guided by three research questions: RQ1: What is the EDS design that would help this group of Primary 5 students to achieve the CCE goals? RQ2: How is the design implemented? and RQ3: What are the outcomes of the design? The current design narrative focuses on RQ1, particularly the goal of value-based choices guided by students' thinking.

2.2 Theoretical Grounding and the Initial Design Principle: SMART

The study was theoretically grounded in Paul and Elder's (2006, 2008) framework of critical thinking (element of thought, intellectual standards, and intellectual traits) and Lambert's (2013) digital storytelling framework, including the seven-element framework (point of view, dramatic question, emotional content, gift of voice, power of soundtrack, economy, packing) and seven-step process (owning your insight, owning your emotions, finding the moment, seeing your story, hearing your story, assembling your story, sharing your story).

These theoretical commitments were further operationalised through an initial set of five design principles, collectively known as SMART (Skills, Making, Agency, Reflection, Thinking), distilled from a systematic review of educational digital storytelling (EDS) studies (Wu, 2020) and relevant literature and adopted as the organising framework for the workshop design purpose. SMART principles are based on tested practice and capture the essential conditions for meaningful critical and creative thinking in an EDS context: students must first be equipped with the necessary Skills for multimodal story production (Rolon-Dow, 2011); they must engage in Story Making (creation) (Sadik, 2008) and design of meaning (New London Group, 1996); they must exercise and develop learner epistemic Agency through authoring choices and govern their own learning (Estad & Silsetch, 2008); they must be engaged in critical Thinking through story circles and critical questioning and generative questions (Oppermann, 2008; Schmoelz, 2018); and they must be involved in Reflection on values, lived experience, and their own reasoning processes (Hurst, 2014).

Conjecture mapping (Sandoval, 2004, 2014) was adopted alongside the design-based research (DBR) model of McKenney and Reeves (2014) to make the SMART design reasoning explicit, testable, and revisable across iterative cycles, ensuring that each principle was not merely stated but systematically instantiated, evidenced, and refined in practice. Both intervention data (11 sets of student artefacts, 6 thirty-minute story circle dialogues, reflection artefacts including 135 one-minute papers and 36 sets of final reflection, and 4 field notes) and complementary data (7 one-hour student group interviews, 2 one-hour teacher interview, and 13 sets of researcher reflection) for the two cycles were collected and analysed with thematic analysis (Charmaz, 2014). Readers interested in the complete methodology report may refer to the author's work (Wu, 2020).

2.3 SMART-Guided Educational Digital Storytelling Workshop

Guided by the SMART design principles and the relevant conjectures, an eleven-hour EDS) activity outline for Cycle 1 was drafted. As shown in Appendix 1, it comprised six sessions. Students first familiarised themselves with EDS and the video-making application (DPSkill). They went through the process of story ideation, story sketching, media orchestration – putting the story together, and grand viewing in creating a value-themed story (Cycle 1: Respect and Cycle 2: Responsibility) (DPMaking) and enjoyed a high level of autonomy, such as story content, story mode, and flow of construction (DPAgency). Story circles were designed to facilitate critical thinking

about their created work (DPThinking), and reflection activities (DPReflection) were arranged to encourage students further to relate the story to themselves and make value-based choices. Two cycles of workshops were implemented from March 2018 to December 2018.

2.4 What Worked? What did not Work and Why?

This section reviews the implementation of each Design principle, particularly DPTinking, DPAgency, and DPReflection and a new principle DPDilemma, based on which implications are drawn in the next section. DPTinking initially started with the teacher verbally asking thought-provoking questions to facilitate critical and creative thinking, such as “What are we assuming here?”, “How would another group of people view it and be affected by this?”, “What could be the consequence?”, “What could be the alternative perspective and consequence?”, and “Is there a better question to ask?”. It was observed that only a few students were able to think independently after the facilitation, asking questions such as “What is respect in the story?” (Cycle 1 Story circle 1). It is confirmed in the one-minute paper, in which most student reflected upon the technical skills they had developed, with little reflection on the content such as their conception of the value of respect and how the conception can be refined. The issue could be due to the lack of interaction among students and lack of teacher guidance (Aouaf et al., 2023), suggesting a need for explicit teaching of thinking skills and more scaffolding.

The author refined DPTinking to Guided Thinking - T_g (explicit teaching and textual, visual, and verbal facilitation) with dedicated class time and Independent Thinking - T_i by students. Building on the questions raised by more advanced students, the class was guided to explore what a critical and creative thinker looked like, how they thought and acted, and with what questions they usually engaged. Hint cards with questions, informed by Paul and Elder (2008), as shown in Appendix 2, were provided to each student to encourage the independent consideration of additional information, clarification, multiple perspectives, challenging viewpoints, and self-assessment of thinking. As a result of these changes, the story circle process was more focused on thinking critically and creatively about the stories while the outcomes of value-guided decision making were better achieved with students discussing “Is this a responsible act?” “What would be a responsible act in this case?” and commenting “I have learned to be more responsible”, and “When I grow up, I will be responsible to take care of my family”. (Cycle 2 story circle, and Cycle 2 student interview and teacher interview). DPAgency was instantiated as learner options such as authoring choices, which enabled the making of media artefacts. They were also encouraged to explore the character’s value position and choice making in the story (for example, whether or not to maintain a respectful act when a friend showed a disrespectful act). The analysis of the Cycle 1 group interview showed students typically associated agency with authoring choices and not value-based choice. Thus, in Cycle 2, the author further encouraged agency by engaging learners in exploring the consequences of one’s choice and alternative choices and possible alternative consequences (Cycle 2 story circle). It was found that this adjustment better enhanced students’ awareness of choice both in the story and their own lives (Cycle 2 student interview). Some even

commented that they would “think before they choose”, and they would “choose to be responsible” (Cycle 2 student interview).

DPrelection was initially designed as an individual activity: One-minute paper (2 takeaways, 1 value-focused question, and 1 recommendation) and final reflection paper (on the learning and gains in the workshop). In Cycle 2, to encourage reflection as a whole class, the author built on the format of the story circle and engaged the class in reflecting on the thought-provoking questions raised by some good students, such as “Does everyone have responsibility?” and “What if someone is not responsible, what should I do?” (Cycle 2 one-minute paper). It worked out well, as reflected in the one-minute papers of the session: more students are asking deeper value-focused questions. The author thus refined the DPrelection into individual reflection-R_i following the initial design and collective reflection - R_c as an emerging principle.

Finally, a new DP, namely DPDilemma, was recommended. Cycles 1 and 2 were both value-story-themed. While they were effective in encouraging critical and creative thinking about one’s identity and social relationships, their effect on value-based choices was inconsistent among students. Some were able to connect their learning to choice-making in life, while for some, “we were creating a value story and not a choice story” (Cycle 1 student interview). Dilemma and tension in the story are thus important as they help to explicate reasoning and decision making (Kohlberg, 1984). The author thus suggests that future studies explore the making of dilemma stories where values are tested and challenged (for example, to report or not report your best friend who cheated in the examination). Such intensity helps students to better clarify the values and examine the conditions in which they will stand or not by their values. It also points more directly to value-based choices, one of the goals in CCE learning. Appendix 3 summarizes how the refined DPs can be instantiated into the learning activities in the six sessions of a DS workshop.

2.5 Implications of SMART to D-SMAR_i R_c T_g T_i

Three implications can be drawn from this K-12 study concerning the development of critical and creative thinking. First, the mechanism of community space in the forms of story circle and collective reflection has been proven effective in sharpening participants’ thinking and shaping their dispositions. Several students commented that working with their peers and the class enabled them to develop multiple perspectives and inspired them to revisit their values and choices in life. Second, agency in authoring and empowering the story character with a voice and well-informed choices helped them to think deeper about their own choices. Their comments that they would “think before they choose” and they would “choose to be responsible” demonstrate their autonomy in thinking and acting. Finally, tensions are necessary in developing critical and creative thinking about one’s choice in life.

The study proposes a theory for CCE learning called “tinkering tensions for collective reasoning”, suggesting that instructors engage students to tinker and play with the tensions of the story, for example, the relationship of characters, the severity of situation, or the gains and losses of each choice. Students may examine their own

choices in every tinkering, collectively discussing and reasoning about their choices. It improves their assessing of situations and informs their judgement through articulation and co-reasoning.

3. The New Context (Teacher Professional Development)

This paper further extends the K-12 context to the higher education teacher professional learning context. The setting is a postgraduate course on new media and learning in a teacher education institute in Singapore. The course aims to engage participants in examining the existing new media environment and provide an embodied new media experience. It is informed by the new media literacy framework (Chen et al., 2011; Lin et al., 2013), which explores the socio-cultural and technical dimensions of new media and suggests a two-dimensional continuum of media literacy from consuming to prosuming (production + consumption) literacy and from functional to critical literacy. The framework functions as the overarching guidelines for the course. The design of the course activity involves critical media reading and consumption as well as critical media production and participation in online communities.

The prior K-12 study has the potential to inform the current course in several important ways. Its EDS design aligns with the prosumption literacy dimension of the framework, engaging students as active producers and consumers of multimodal meaning. Equally, its emphasis on critical and creative thinking connects to the critical literacy dimension, as both involve the critical analysis of texts, ideas, and lived experience, moving students beyond passive reception toward reasoned, reflective, and socially aware engagement. The author thus modifies the design principles by examining the course context and extending the literature. The following paragraphs elaborate on the new set of design principles MASTER, including what they are and how they may help to develop the teachers into critical and creative beings and nurture similar dispositions and skills in their students.

4. The Reconceptualized Design Principles MASTER and Activity Outline

DPM refers to the design principle of Multiplexity, namely the multiple tasks, roles, and perspectives in the course learning environment. It is reflected in a multiplex connection between people and tools that constitute the online and offline hybrid learning environments (Lister, 2024). Specifically, participants engage in three projects in the course, which provide different exposures to enhance their critical and creative thinking. In the first project, they role play in the educational digital storytelling workshop (EDS) as Primary 5 students to recall a dilemma they once faced and create a digital story about it. In the second project, the new media project, they assume the role of new media user and create a counter story video to challenge a prevailing belief or practice, or both, in media-mediated learning and shared their critical understanding of the topic. They upload the video to the course YouTube channel and participate in the YouTube discussion. In the third project, the facilitation project, they return to their role as schoolteachers to design a 21st learning experience with new media. Multiplexity has the potential to further amplify DPMaking in the K-12 study. As Shinas et al. (2022) reported, assignments such as educational digital

storytelling in teacher preparation develop the necessary knowledge and dispositions in teachers, while simultaneously modelling pedagogy and scaffolding their capacity to design similar experiences for their own students. Such assignments also strengthen teachers' self-efficacy and create meaningful space for identity exploration and professional reflection.

DPA, on the other hand, refers to the design principle of Agency at a higher level, such as developing one's own construction path. The agency of construction path, according to Anderson and Wales (2012), is more than a mere production procedure. In a nutshell, it is a meaning-making and thinking process. Exercising such agency helps to reduce the constraints and allows participants to be both creative and critical in their projects. For example, instead of a linear path of deciding the script and the genre and creating a video to stick to the genre, they may attempt different genres such as a TED Talk, interview, or cartoon at different stages of production to observe and compare the created meaning. DPS, in the current context, refers to the design principle of Space. Building on the community space in the K-12 study, the course in the professional learning can further incorporate an authentic new media YouTube channel and Facebook group. It is not merely a shift or an extension of the learning space. As researchers (Lee & Lee, 2025) reported, the spatial perception, namely a concept of experience that a user perceives in a particular space and sense of openness of online space and its organisational structure, such as layout, arrangement and sequence, significantly influences the satisfaction of space. It can entail changes in many ways. It may change the nature of the course from a simulated classroom project to an authentic new media project in an online space. The participants may get to experience the life of a YouTuber, having their videos created and posted on the platform. It may also bring them the authentic viewers and interactants beyond the class circle. Overall, the new media space may make learning more authentic and meaningful, allowing more perspective-taking (beyond the class), more assessing and evaluating of feedback and viewpoints, and greater possibilities of creative ideas.

The next design principle, DPT, refers to the Transformative Thinking triggered by cognitive dissonance and disorienting dilemmas. Drawing on the work of Festinger (1957), the course creates productive tension by confronting participants with experiences and perspectives that conflict with their existing beliefs about teaching, learning, and new media. Such tension, as Mezirow (1991) argued, functions as a disorienting dilemma, a catalyst that disrupts taken-for-granted assumptions and opens the learner to critical reflection and perspective transformation. DPT Transformative Thinking thus builds on and extends the design principle of Dilemma developed in the prior K-12 study, shifting from value-based dilemmas for primary students to professionally situated cognitive tensions for teacher learners. Central to this transformation is what Torres-Olave et al. (2025) call critical imagination, namely the capacity to break with taken-for-granted assumptions and envision new ways of being and acting as a professional, which the course cultivates by repositioning teachers across multiple roles and perspectives. For example, a teacher who enters the course believing that good teaching means direct instruction may experience cognitive dissonance when repositioned as a learner in the first EDS

project — navigating uncertainty, making authoring choices, and sharing personal perspectives in a story circle. This tension deepens as they shift roles across the three projects, culminating in what Mezirow (1991) termed a disorienting dilemma — a fundamental questioning of their assumptions about teaching, learning, and knowledge. The resolution of this dilemma, arriving at a new and more critically informed professional stance, is precisely the transformative thinking DPT seeks to cultivate.

The next DPE refers to the design principle of Embodied Experience. As Loughran (2006) contends, teachers who personally experience the kind of learning they are expected to facilitate develop a deeper understanding of its demands and possibilities, knowledge that cannot be acquired through conceptual understanding alone. In the current course, participants experience critical and creative thinking firsthand across three projects, each repositioning them in a new role, namely as Primary 5 students, as new media users challenging prevailing viewpoints, and as designers of 21st-century learning. The embodied experience thus functions as both a learning outcome and a pedagogical model, allowing teachers to experience what they are expected to teach.

The last DP, namely DPR, refers to the design principle of Reflection, building on the individual and collective reflection activities established in the prior K-12 study. In the current course, participants submit a reflection paper upon completion of each project, examining their beliefs and interrogating why they hold certain views, a practice central to critical thinking, as purposeful thinkers are aware of their own assumptions and presuppositions (Paul & Elder, 2006). Collective reflection further extends this process, engaging participants in shared examination of prevailing views on new media and learning, such as technopoly, with a Padlet page created to sustain reflective practice beyond the course. Based on the set design principles, MASTER, a 13-week activity is designed for the course and the learning activities, and the relevant guiding DPs are explained in Appendix 4. The proposed course will be empirically tested through a multiple-cycle design-based research process mirroring the rigorous data collection and analysis procedures of the prior K-12 study, including iterative implementation, systematic analysis of participant artefacts and reflections, and progressive refinement of the design principles.

5. Discussion and Implications

This section reflects on the design in the professional learning context and discusses its implications across three dimensions of teacher development: the teacher as a critical and creative being, as an agentic being, and as a social being. While grounded in the current course context, these implications extend beyond it, offering transferable insights for the broader design of critical and creative thinking in teacher professional learning.

5.1 Teachers as Critical and Creative Beings

Many teachers lack firsthand experience in the collaborative, thinking-intensive activities they are expected to facilitate (Bedir, 2019; Leibovitch et al., 2025), a gap that

cannot be meaningfully addressed through conceptual understanding alone. The MASTER design responds directly through two complementary principles: DPE and DPM. DPE emphasizes Embodied Experience of teachers (Loughran, 2006, Moreno, 2025) and positions teachers as active learners of critical and creative thinking across three projects, navigating uncertainty, making reasoned choices, and constructing new understanding from the inside out. DPM, or Multiplexity in Making, deepens this by requiring teachers to think critically and creatively from multiple angles, shifting roles from student to designer to new media user, each demanding a different critical and creative stance. Together, DPE and DPM embody a core argument of this paper: that developing teachers as critical and creative beings is most effectively achieved, not through transmission of knowledge about thinking, but through sustained, structured immersion in thinking itself. Future studies may further investigate effective designs for developing teachers as critical and creative beings. EDS and media production are one possible approach; however, alternatives such as integrated projects, task-based learning, and Socratic dialogues may equally serve this purpose. What matters is not the specific activity but the underlying principle: teachers are developed as critical and creative beings through active, embodied participation in thinking itself.

5.2 Teachers as Agentive Beings

Teacher professional development is, in essence, the development of teachers into agentive beings, namely professionals with sound judgment, inventive thinking, and the proactiveness to bring meaningful change to education. Central to this development is the cultivation of professional identity. Teachers who see themselves as agents must first experience what it means to act agentively, to make choices, assert voices, and take ownership of their own learning (Hermelin Fine et al., 2026). The MASTER design principles address this through two complementary principles: DPA and DPT. DPAgency empowers teachers to exercise authoring options across the three projects and more critically, to develop and assert their own voices and viewpoints rather than submitting to prevailing perspectives. DPTransformative Thinking complements this by engaging teachers in unpacking prevailing views, interrogating underlying assumptions, and cultivating critically informed professional stances. This course recognises that teachers are continuously evolving professionals and deliberately incubates this transformation, not as a fixed endpoint but as an ongoing process of critical questioning, perspective shifts, and professional renewal. Together, the two DPs create the conditions for teachers to develop systematic thinking, clarity of mind, and the courage to change. It is important to acknowledge, however, that agency is not developed in a short course alone. As Emirbayer and Mische (1998) contended, agency builds on past patterns of thought and action through selective reactivation over time. This course aims to provide such practical experiences as a foundation, with future studies investigating how teacher agency can be sustained beyond it.

5.3 Teachers as Relational Beings

Teachers are fundamentally relational beings. Their professional identities, knowledge, and practices are co-constructed through relationships with students,

peers, and communities (Gergen, 2009; Jiang & Kang, 2025). As Gergen (2009) argued, meaning and understanding do not reside within individuals alone; they emerge through relational engagement, a perspective that foregrounds the social and collaborative dimensions of teacher professional development. The MASTER framework inherently embodies this relational dimension across its principles. DPSPACE situates learning in authentic relational spaces — YouTube for communication with audiences beyond the course and Facebook for peer collaboration. DPM engages teachers in collaborative meaning-making through group media production. DPA involves collective negotiation of viewpoints and authoring choices. DPT and DPR foster peer-supported transformative thinking and collective reflection, deepening both individual and shared professional understanding. Rather than treating relationality as incidental, MASTER positions it as a necessary condition for the development of teachers as critical, creative, and collaborative professionals, embodying the 4Cs of 21st-century learning: Communication, Collaboration, Critical Thinking, and Creativity (Supena et al., 2021). Future studies may further investigate approaches such as collaborative inquiry and project-based learning to deepen the relational dimensions of teacher professional development.

6. Conclusion

This study extends the author's earlier empirical work on developing critical and creative thinking in a K–12 context (Wu, 2020) to the higher education context of a teacher professional development course. Addressing the persistent gap whereby many teachers remain inadequately prepared to teach critical and creative thinking explicitly and sustainably, the study proposes a course design guided by new media literacy frameworks and the findings of the prior K–12 study and its implications on community space in the forms of story circle and collective reflection, agency in authoring and voicing, and necessity for tinkering of tensions and collective reasoning. The refined design principles, collectively named MASTER (Multiplexity in Making, Agency, Space, Transformative Thinking, Embodied Experience, and Reflection), are elaborated on and discussed as a principled and adaptable framework for teacher professional learning. Each principle is grounded in relevant literature and instantiated through concrete learning activities, making visible the design reasoning and deliberations that inform the course. The study further discusses implications for teacher professional development across three dimensions: the teacher as a critical and creative being, as an agentic being, and as a relational being, arguing that effective professional learning must develop not only teachers' pedagogical knowledge but also their embodied experience of thinking critically and creatively, their capacity for autonomous professional judgment, and their relational engagement with peers and communities. It is the author's hope that this study sheds light on the design of teacher professional development and contributes to cultivating critical and creative teachers for future generations.

7. References

- Abrami, P. C., Bernard, R. M., Borokhovski, E., Wade, A., Surkes, M. A., Tamim, R., & Zhang, D. (2008). Instructional interventions affecting critical thinking skills and dispositions: A stage 1 meta-analysis. *Review of Educational Research*, 78(4), 1102–1134. <https://doi.org/10.3102/0034654308326084>

- Agusta, A. R., & Noorhapizah. (2020, December). The exploration study of teachers' knowledge and ability on application of critical thinking and creative thinking skills on learning process in elementary school. In *Proceedings of the 6th International Conference on Education and Technology (ICET 2020)* (pp. 29–42). Atlantis Press.
- Akpur, U. (2020). Critical, reflective, creative thinking and their reflections on academic achievement. *Thinking Skills and Creativity*, 37. <https://doi.org/10.1016/j.tsc.2020.100683>
- Althof, W., & Berkowitz, M. W. (2006). Moral education and character education: Their relationship and roles in citizenship education. *Journal of Moral Education*, 35(4), 495–518. <https://doi.org/10.1080/03057240601012204>
- Anderson, K. T., & Wales, P. (2012). Can you design for agency? The ideological mediation of an out-of-school digital storytelling workshop. *Critical Inquiry in Language Studies*, 9(3), 165–190. <https://doi.org/10.1080/15427587.2012.627021>
- Aouaf, S., Azzouzi, L., & Housni, H. (2023). Perceived barriers to critical thinking development: The student's view. *International Journal of Linguistics, Literature and Translation*, 6(2), 63–69. <https://doi.org/10.32996/ijllt.2023.6.2.10>
- Australian Curriculum, Assessment and Reporting Authority (ACARA). (n.d.). *Understand this general capability: Critical and creative thinking*. <https://v9.australiancurriculum.edu.au/teacher-resources/understand-this-general-capability/critical-and-creative-thinking>
- Bedir, H. (2019). Pre-service ELT teachers' beliefs and perceptions on 21st century learning and innovation skills (4Cs). *Journal of Language and Linguistic Studies*, 15(1), 231–246. <https://doi.org/10.17263/jlls.547718>
- Charmaz, K. (2014). *Constructing grounded theory* (2nd ed.). SAGE.
- Chen, D. T., Wu, J., & Wang, Y. M. (2011). Unpacking new media literacy. *Journal of Systemics, Cybernetics and Informatics*, 9(2), 84–88.
- De Jager, A., Fogarty, A., Tewson, A., Lenette, C., & Boydell, K. M. (2017). Digital storytelling in research: A systematic review. *The Qualitative Report*, 22(10), 2548–2582. <https://doi.org/10.17648/tqr.v22i10.2960>
- Emirbayer, M., & Mische, A. (1998). What is agency? *American Journal of Sociology*, 103(4), 962–1023. <https://doi.org/10.1086/231294>
- Estad, O., & Silseth, K. (2008). Agency in digital storytelling: Challenging the educational context. In K. Lundby (Ed.), *Digital storytelling, mediatized stories: Self-representations in new media* (pp. 213–232). Peter Lang.
- Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford University Press.
- Fullan, M., Quinn, J., & McEachen, J. (2018). *Deep learning: Engage the world change the world*. Corwin Press.
- Gergen, K. J. (2009). *Relational being: Beyond self and community*. Oxford University Press.
- Hoadley, C. P. (2002). Creating context: Design-based research in creating and understanding CSCL. In *Proceedings of the Conference on Computer Support for Collaborative Learning: Foundations for a CSCL Community* (pp. 453–462). Lawrence Erlbaum Associates.
- Hermelin Fine, Y., Wizman Man, D., & Lapidot-Lefler, N. (2026). Building teacher agency through narrative pedagogy: Implications for educator well-being and sustainable education. *Sustainability*, 18(8), 3779.
- Hurst, B. (2014). Storytelling for student engagement. *Language Arts Journal of Michigan*, 29(2), 36–42.
- Jiang, M., & Kang, H. (2025). A qualitative study on the turnover intention of the new generation of rural teachers from the perspective of relational being. *Journal of Teacher Education*, 12(4), 114–122. <https://www.chndoi.org/Resolution/Handler?doi=10.13718/j.cnki.jsjy.2025.04.013>

- Kanagaratnam, T. (2015). *A study on teacher perceptions about character and citizenship education (CCE) in Singapore* [Doctoral dissertation, National Institute of Education, Nanyang Technological University]. NIE Digital Repository. <https://hdl.handle.net/10497/16828>
- Kohlberg, L. (1984). *The psychology of moral development: The nature and validity of moral stages*. Harper & Row.
- Lambert, J. (2013). *Digital storytelling: Capturing lives, creating community* (4th ed.). Routledge.
- Lee, H., & Lee, D. (2025). Exploring spatial perceptions in online environments: Focus on workspace and SNS. *Information Development*. <https://doi.org/10.1177/02666669251345085>
- Leibovitch, Y. M., Beencke, A., Ellerton, P. J., McBrien, C., Robinson-Taylor, C. L., & Brown, D. J. (2025). Teachers' (evolving) beliefs about critical thinking education during professional learning: A multi-case study. *Thinking Skills and Creativity*, 56, 101725. <https://doi.org/10.1016/j.tsc.2024.101725>
- Lin, T. B., Li, J. Y., Deng, F., & Lee, L. (2013). Understanding new media literacy: An explorative theoretical framework. *Journal of Educational Technology & Society*, 16(4), 160–170.
- Lister, P. (2024). *Considering user experience in smarter hybrid distance learning*. <https://doi.org/10.31235/osf.io/b9d8s>
- Loughran, J. J. (2006). *Developing a pedagogy of teacher education: Understanding teaching and learning about teaching*. Routledge.
- McKenney, S., & Reeves, T. C. (2014). *Conducting educational design research*. Routledge.
- Mezirow, J. (1991). *Transformative dimensions of adult learning*. Jossey-Bass.
- Singapore Ministry of Education (MOE). (n.d.). *21st century competencies*. <https://www.moe.gov.sg/education-in-sg/21st-century-competencies>
- Mor, Y. (2011). Design narratives: An intuitive scientific form for capturing design knowledge in education. In *Proceedings of the 6th Chais Conference on Instructional Technologies Research: Learning in the Technological Era* (pp. 57–63). Open University of Israel.
- Moreno, R. (2025). Centering empathy through embodied experiential learning in teacher education. *TESOL Journal*, 16(1), e70000. <https://doi.org/10.1002/tesj.70000>
- New London Group. (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review*, 66(1), 60–92. <https://doi.org/10.17763/haer.66.1.17370n67v22j160u>
- Newton, L., & Newton, D. (2010). Creative thinking and teaching for creativity in elementary school science. *Gifted and Talented International*, 25(2), 111–124. <https://doi.org/10.1080/15332276.2010.11673575>
- Oppermann, M. (2008). Digital storytelling and American studies: Critical trajectories from the emotional to the epistemological. *Arts and Humanities in Higher Education*, 7(2), 171–187. <https://doi.org/10.1177/1474022208088647>
- Paul, R., & Elder, L. (2002). *Critical thinking: Tools for taking charge of your professional and personal life*. Financial Times/Prentice Hall.
- Paul, R., & Elder, L. (2006). Critical thinking: The nature of critical and creative thought. *Journal of Developmental Education*, 30(2), 34–35.
- Paul, R., & Elder, L. (2008). *Critical and creative thinking*. Foundation for Critical Thinking. https://www.thefont.co.za/wp-content/uploads/2020/03/007-Paul-Elder-2008-A-FULL-Guide-to-Crit-Thinking-Concepts_Tool.pdf
- Retna, K. S. (2007). The learning organisation: A school's journey towards critical and creative thinking. *The Asia-Pacific Education Researcher*, 16(2), 127–142. <https://doi.org/10.3860/taper.v16i2.247>

- Rolon-Dow, R. (2011). Race(ing) stories: Digital storytelling as a tool for critical race scholarship. *Race Ethnicity and Education*, 14(2), 159–173. <https://doi.org/10.1080/13613324.2010.519975>
- Romero, M. (2026). Evaluating the evolution of critical thinking, creativity, communication and collaboration in higher education courses. *Creative Education*, 17, 49–57. <https://doi.org/10.4236/ce.2026.171004>
- adik, A. (2008). Digital storytelling: A meaningful technology-integrated approach for engaged student learning. *Educational Technology Research and Development*, 56(4), 487–506. <https://doi.org/10.1007/s11423-008-9091-8>
- Sandoval, W. A. (2004). Developing learning theory by refining conjectures embodied in educational designs. *Educational Psychologist*, 39(4), 213–223. https://doi.org/10.1207/S15326985EP3904_3
- Sandoval, W. A. (2014). Conjecture mapping: An approach to systematic educational design research. *Journal of the Learning Sciences*, 23(1), 18–36. <https://doi.org/10.1080/10508406.2013.778204>
- Schmoelz, A. (2018). Enabling co-creativity through digital storytelling in education. *Thinking Skills and Creativity*, 28, 1–16. <https://doi.org/10.1016/j.tsc.2018.02.002>
- Seman, S. C., Yusoff, W. M. W., & Embong, R. (2017). Teachers challenges in teaching and learning for higher order thinking skills (HOTS) in primary school. *International Journal of Asian Social Science*, 7(7), 534–545. <https://doi.org/10.18488/journal.1.2017.77.534.545>
- Shinas, V. H., Wen, H., & Guo, D. (2022). Developing teachers as writers: Teacher candidates' perceptions of digital multimodal composition. In *Handbook of research on teacher practice for diverse writing instruction* (pp. 88–107). IGI Global.
- Supena, I., Darmuki, A., & Hariyadi, A. (2021). The influence of 4C (Constructive, Critical, Creativity, Collaborative) learning model on students' learning outcomes. *International Journal of Instruction*, 14(3), 873–892. <https://doi.org/10.29333/iji.2021.14351a>
- Terblanche, A., Van Rooyen, A. A., & Enwereji, P. C. (2025). When teachers become learners: Challenges with the integration of critical thinking into accounting curricula. *Thinking Skills and Creativity*, 58, 101878. <https://doi.org/10.1016/j.tsc.2025.101878>
- Torres-Olave, B., Avraamidou, L., & Moura, C. B. (2025). Critical imagination for transformative agency: Pedagogies for science teacher education. *Science Education*, 109(5), 1484–1498. <https://doi.org/10.1002/sce.21970>
- Vincent-Lancrin, S., González-Sancho, C., Bouckaert, M., de Lemos, F., Feuerstein, M., Jacotin, G., Urgel, J., & Vidal, Q. (2019). *Fostering students' creativity and critical thinking: What it means in school, educational research and innovation*. OECD Publishing. <https://doi.org/10.1787/62212c37-en>
- Wu, J. (2020). *Educational digital storytelling for character and citizenship education in a Singapore primary school: A design-based research study*. [Doctoral dissertation, National Institute of Education, Nanyang Technological University]. NIE Digital Repository. <https://doi.org/10.32658/10497/22832>

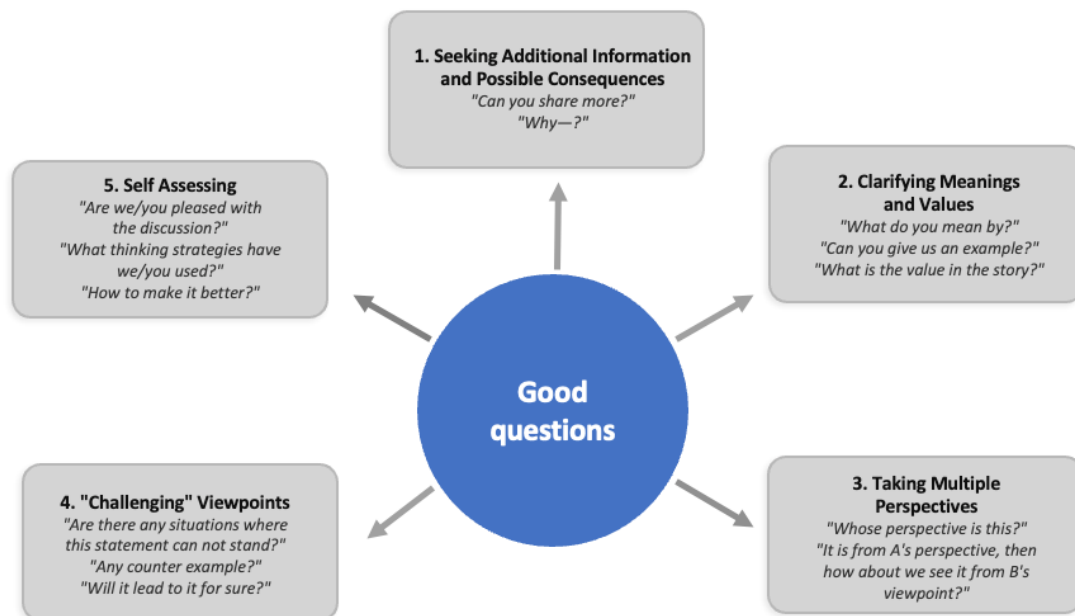
This paper may be cited as:

Wu, J. (2026). Design Principles for Critical and Creative Thinking in Teacher Professional Development: A Continued Design Narrative across K-12 and Higher Education Contexts. *International Journal on Multidisciplinary and Applied Research*, 2(1), 1-19. <https://doi.org/10.63236/ijmar.2.1.1>

Appendix 1: Proposed design of CCE learning in Primary 5: Creating a digital dilemma story

Session	Activity	Relevant DP
1	Introduction of EDS	DPSkill
	Training of video making apps (making a simple story)	DPMaking
2	Story ideation -Recall a personal experience associated with the value of respect -Share within group and select a story together	DPMaking DPAgency
	Story circle -Explicit learning of critical thinking (making a value story)	DPTThinking
	Individual reflection	DPRReflection
3	Story sketching (develop a sketch of the selected story)	DPMaking
	Story circle - Present the sketch and peer critique - Modify the story based on the feedback	DPAgency DPTThinking
	Individual reflection	DPRReflection
4	Media orchestration (integrating media resources for the first cut)	DPMaking DPAgency
	Individual reflection	DPRReflection
5	Story circle - Present the first cut and peer critique - Modification of the story based on the feedback	DPTThinking DPMaking DPAgency
	Revision of the first cut	DPMaking DPAgency
6	Grand viewing -Share the story -Share the takeaways	DPRReflection

Appendix 2: Hint cards on good questions to guide critical and creative thinking



Appendix 3: Proposed design of CCE learning in Primary 5: Creating a digital dilemma story

Session	Activity	Relevant DP
1	Introduction of EDS Training of video making apps (making a simple story)	DPSkill DPMaking
2	Story ideation -Recall a personal experience of dilemma of value-based choices -Share within group and select a story together Story circle -Explicit learning of critical thinking (a dilemma story for class discussion, modelling and facilitating critical thinking, Individual reflection	DPMaking DPAgency DPThinking (Guided) DPReflection (Individual)
3	Story sketching (develop a sketch of the selected story) Story circle - Present the sketch and peer critique with provided hint cards on asking for additional info, clarifying meanings, taking alternative perspectives, challenging views and assumptions, and examining own thinking - Vote to gather responses. Collectively change the story elements to intensify the dilemma. Unpack the nature of the dilemma ("Why do you choose this option?") Individual reflection	DPMaking DPAgency DPThinking (Guided and Independent) DPDilemma DPReflection
4	Reflect as a class Media orchestration (integrating media resources for the first cut) Individual reflection	DPReflection(collective) DPMaking DPAgency DPReflection
5	Reflect as a class Story circle - Present the first cut and peer critique with provided hint cards on asking for additional info, clarifying meanings, taking alternative perspectives, challenging views and assumptions, and examining own thinking - Vote to gather responses. Collectively modify the story elements to intensify the dilemma. Unpack the nature of the dilemma ("Why do you choose this option?") Editing of the first cut	DPReflection(collective) DPThinking (Guided and Independent) DPDilemma DPMaking DPAgency DPMaking DPAgency
6	Editing of the first cut Grand viewing -Share the story -Share the takeaways	DPMaking DPAgency DPReflection (collective)

Appendix 4: Course design of New Media and learning, a professional development course

Week	Main Learning Activity	Primary DP in the session
1	Introduction of course	NA
2	New Media Literacy -Class discussion	NA
3	Project 1 – EDS -Ideation and sketching -Story circle -Orchestration of media	DPMultiplexity in Making DPAgency DPTransformative Thinking
4 (Self-learning week)	Project 1 – EDS Media orchestration	DPMultiplexity in Making DPAgency DPEmbodied Experience
5	Project 1 – EDS -First cut -Story circle -Revision	DPMultiplexity in Making DPTransformative Thinking DPEmbodied Experience
6	Project 1 – EDS -Grand viewing Project 2 – New Media Project -Ideation -Share on Facebook group and peer discussion Reflection (assignment)	DPSpace DPReflection
7	Project 2 – New Media Project -Consultation -Share in Facebook group	DPSpace
8	Project 2 – New Media Project -Design and creation - Story circle -Submission to YouTube channel	DPMultiplexity in Making DPSpace DPTransformative Thinking DPEmbodied Experience
9	Project 2 – New Media Project -Participation in YouTube channel	DPSpace
10	Project 3 – Facilitation Project -Ideation -Story circle	DPMultiplexity in Making DPTransformative Thinking
11	Project consultation	All principles
12	Project 3 – Facilitation Project -Story circle Reflection (assignment)	DPTransformative Thinking DPReflection
13	Course reflection	DPReflection