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Reimagining Teaching Portfolios Through Personal Knowledge Management with Digital Tools for Thought

Abstract

In higher education, teaching portfolios are instruments for faculty professionalization and academic development. Many lecturers struggle to systematically document, evaluate, and further develop their teaching competencies. We argue that teaching is knowledge work requiring intentional knowledge management. We explore how digital Tools for Thought (TfTs) support personal knowledge management (PKM), enabling lecturers to externalize, link, and reflect on teaching-related knowledge and materials. Using TfTs, teaching portfolios transform from static repositories into dynamic systems fostering critical reflection and evidence-informed professional development. Drawing on educational psychology and higher education research, we demonstrate how PKM practices can boost teaching competence.

Keywords

academic development; teaching portfolio; digital tools for thought; personal knowledge management; teaching competence

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Lehrportfolios neu gedacht durch persönliches Wissensmanagement mit digitalen Denkwerkzeugen

Zusammenfassung

Lehrportfolios sind Instrumente zur Professionalisierung von Lehrenden und der Hochschulentwicklung. Vielen Dozierenden fällt es schwer, ihre Lehrkompetenzen systematisch zu dokumentieren, zu evaluieren und weiterzuentwickeln. Wir argumentieren, dass Lehre im Kern Wissensarbeit ist, die gezieltes Wissensmanagement erfordert. Wir untersuchen, wie digitale (Denk-)Werkzeuge (TfTs) das persönliche Wissensmanagement (PKM) unterstützen und es Lehrenden ermöglichen, lehrbezogenes Wissen zu externalisieren, zu verknüpfen und zu reflektieren. Durch die Integration von TfTs können Lehrportfolios zu dynamischen Systemen transformiert werden, die gleichermaßen kritische Reflexion und evidenz-informierte professionelle Entwicklung fördern. Mit Bezug auf lehr-/lernpsychologische und hochschuldidaktische Forschung zeigen wir auf, wie PKM-Praktiken Lehrkompetenz fördern können.

Schlüsselwörter

Hochschuldidaktik, Lehrportfolio, Digitale Denkwerkzeuge, Persönliches Wissensmanagement, Lehrkompetenz

1 Introduction

Higher education is undergoing profound transformation. Amid growing demands for accountability, transparency, and evidence-informed quality assurance, university lecturers are increasingly expected to make their teaching competence visible and to document the development of their teaching competence (Kordts-Freudinger et al., 2021; MacLaren, 2005; Salmhofer, 2020). Teaching portfolios are widely used instruments to support this process (Fitzpatrick & Spiller, 2010; Seldin et al., 2010), serving different purposes: encouraging reflection and professional growth in teaching practices and evaluative functions for hiring, tenure, or promotion (Szczyrba & Gotzen, 2012).

However, many lecturers face systemic and individual barriers in developing such portfolios. Faculty information environments are often characterized by *information overload* (Roetzel, 2019), distraction, and fragmented knowledge sources, ranging from emails, and documents to institutional platforms. We argue that academic teaching is at its core knowledge work: Lecturers continuously acquire, integrate, apply, and generate knowledge related to (their own and other) disciplines, students, and institutional contexts (Reinmann, 2008; Siegel et al., 2024). Yet this knowledge often remains tacit, unstructured, and inaccessible to themselves or others (Probst et al., 2012; Siegel et al., 2021, 2022).

While most literature on portfolios focuses on student learning or institutional implementation (Farrell, 2020; Bräuer, 2016), little attention has been paid to the process-oriented, knowledge-intensive nature of developing a teaching portfolio from the lecturer's perspective. Few empirical or conceptual works have explored how digital TfTs, a new class of note-making tools that can create networked notes, can enhance teaching-related PKM and support sustainable portfolio development (Siegel & Lohner, 2024).

We propose that teaching portfolios, reconceptualized as "living" outcomes of reflective knowledge management, can serve as powerful instruments for profession-

alization and competence development. Digital TfTs offer strong potential to overcome fragmentation, foster critical reflection, and enable dynamic, evolving portfolios beyond static documentation. Accordingly, this article addresses the guiding question: How can PKM and TfTs help faculty create and develop teaching portfolios to effectively document, reflect on, and improve their teaching competencies?

Our contribution builds on the following key assumptions:

1. Professional development enhances teaching quality when lecturers engage in systematic reflection and evidence-informed improvement (Gruber, 2021).
2. Teaching portfolios function effectively as dynamic, reflective systems that support self-regulated learning and critical reflection on teaching and foster professional growth (Seldin et al., 2010).
3. Digital TfTs can augment cognition (Paul, 2021; Piwek & Walker, 2020), enhance knowledge structuring, synthesis and reflection, and support teaching-related professional development.
4. We anticipate that using TfTs for teaching portfolios yields multiple benefits: enhanced pedagogical knowledge, transformed teaching attitudes, and improved reflective practice (Siegel et al., 2021, 2022).
5. When integrated into academic development strategies, teaching portfolios foster both individual growth, collaborative, and institutional learning (Brahm et al., 2016).

We propose a knowledge-centered approach to developing teaching competence, supported by teaching portfolios utilizing digital TfTs (see figure 1). Drawing from current literature, practical examples, and design-based experience, we show how lecturers can build sustainable, meaningful portfolios as part of their everyday teaching knowledge work.

The article is structured as follows: Section 2 conceptualizes academic teaching as knowledge work, introducing PKM for higher education teaching and highlighting digital TfTs' key affordances for enhancing PKM in teaching. Section 3 introduces teaching competence as a dynamic construct developed through reflective practices.

Figure 1: Theoretical Framework for a Knowledge-centered Approach to Developing Teaching Competence

Section 4 examines teaching portfolios and presents practical use cases (see supplementary material) with a markdown editor; a plain-text tool that uses simple syntax to structure and interlink content. Section 5 addresses implementation challenges and implications for academic development. Section 6 concludes by outlining institutional strategies and future research directions.

2 Teaching as Knowledge Work

2.1 Benefits of Knowledge Management in Academic Teaching

Academic teaching can be understood as a form of knowledge work: a complex, intellectually demanding activity involving the ongoing acquisition, integration, transformation, and application of diverse knowledge types (Reinmann, 2008; Siegel et al., 2021; Siegel & Lohner, 2024). University lecturers must master and communicate disciplinary content while navigating didactic principles, student diversity, institutional and professional expectations, and continuous technological and curricular change.

Much of the information and knowledge generated in daily teaching, however, remains fragmented and ephemeral, dispersed across emails, course documents, learning management system platforms, personal notes, evaluations, and informal exchanges. Without intentional structure and archiving, valuable teaching assets, such as assignment instructions, learning activities, or course descriptions, are easily lost, particularly when educators change roles, platforms, or institutions. This fragmentation can impede coherence, reflective practice, and sustained professional growth. As Goodyear et al. (2009) argue, pedagogical knowledge is highly contextual and requires active elaboration and integration to become meaningful, reusable, and applicable. Teaching-related PKM meets this challenge by providing a structured approach to navigate the complexity of academic teaching as knowledge work.

PKM for higher education teaching refers to the systematic, efficient, and sustainable management of knowledge in such contexts (Siegel et al., 2021). Personal Knowledge Management (PKM) in academic teaching is not a single tool or platform but a *set of intentional practices and systems* that help lecturers organize, connect, and reflect on their teaching-related knowledge and activities. Practically, this may take the form of a digital notebook or personal wiki in which educators collect course materials, teaching reflections, feedback, research notes, and ideas. Unlike traditional file storage, PKM systems aim to link content meaningfully connecting, for

example, a lecture plan to student feedback, or a new method to a relevant research article. It includes identifying, acquiring, creating, sharing, using, preserving, and evaluating a wide range of teaching-relevant knowledge: from pedagogical strategies and student feedback to evaluation data, personal teaching experiences, and disciplinary literature (Siegel & Lohner, 2024). PKM transcends mere file storage by strategically capturing and connecting educational knowledge to support reflection, innovation, and action. Knowledge management research traditionally focuses on corporate sector and or team systems (Cheong & Tsui, 2011), but PKM is quickly gaining attention, especially in academia where knowledge work is distributed and self-directed. As Bedford (2020) notes, effective knowledge management allows educators to leverage their intellectual capital, improving teaching and student outcomes, a phenomenon that could be termed *thinking dividends*. PKM also underpins long-term academic achievement, for example, through teaching portfolios (see Section 4). These portfolios, curated from synthesized teaching experiences and knowledge, demonstrate evidence-informed growth and reflective capacity. PKM thus enables the invisible dimensions of teaching to become visible, improvable, and shareable.

In sum, academic teaching concerns not only what is taught and how, but also how teaching-related knowledge is managed and why. Without a deliberate and reflective approach to PKM, valuable insights risk being lost, and with them, valuable learning opportunities for faculty.

Integrating PKM into academic practice offers several benefits. It supports structured reflection and elaboration, enabling lecturers to professionalize themselves and build expertise over time (Gruber, 2021). Writing and note-making can foster conceptual clarity and creativity (Luhmann, 1992). Externalizing thoughts can reduce cognitive load and support executive functioning (Sweller, 2020). Systematic reuse of ideas and materials prevents redundancy and facilitates continuous improvement. However, PKM demands considerable effort. It requires a set of technical, metacognitive, and organizational competencies and depends on both individual motivation and institutional support (Siegel et al., 2021). Siegel & Lohner (2024) discuss potentials and challenges in greater detail.

2.2 Teaching Portfolios with Digital Tools for Thought

TfTs are frameworks, artifacts, and systems (mental, digital, or physical) that extend or augment human cognitive capacities. They help people think, reason, plan, and create in ways that would be slower, harder, or even impossible without them (Paul, 2021, Piwek & Walker, 2020). Especially digital aids (such as note-taking apps, generative AI-tools, other visualization tools) can support cognitive offloading, helping individuals manage complex tasks. Digital TfTs enhance human capabilities through flexible content use, faster information processing, retrieval, and facilitating deriving actionable insights (Piwek & Walker, 2020; Siegel & Lohner, 2024). They enable lecturers to externalize, connect, and revisit their thinking, making experience reusable and improving decision-making (Probst et al., 2012). Broadly, this also includes analog tools like notebooks or diagrams, which serve as *cognitive scaffolds* (Paul, 2021) to help transform and refine knowledge through active interaction. As mental levers (Hutchins, 2000; Paul, 2021), TfTs support the externalization of thought, distributed cognition, and reflective, anticipatory approaches to teaching design. In a narrower sense TfTs are digital note-making applications that enable networked and iterative thinking processes (Siegel, 2025).

Unlike analog TfTs, digital ones support this integration by offering a *personal learning environment* (Attwell, 2021) for managing and bi-directional linking notes and materials, allowing the development of a PKM system (a set of digital and non-digital tools, workflows and practices that support knowledge work; Siegel & Lohner, 2024; Siegel, 2024). Key affordances of TfTs include:

- *Plasticity*: Digital content can be reshaped and iteratively refined.
- *Speed*: Rapid capture and retrieval of ideas enhance responsiveness.
- *Reach*: Materials can be shared and reused easily.
- *Creation*: Supports multimodal input: text, tables, images, videos etc.
- *Scale*: Enables management of complex knowledge structures (Piwek & Walker, 2020)

Modern PKM tools are designed around networked thought (also systems thinking) and offer flexible solutions for creating, storing, and organizing teaching-related information (Siegel, 2025) would be suitable. These tools enable the creation of interlinked notes in markdown, visualization of connections between notes through graphs, and often custom workflows via plugins and templates, with data remaining local and accessible. Crucially, the value of PKM lies not in the tool but in the thinking it enables (Siegel, 2025). Teaching competency development is knowledge work, requiring intentional processes such as reflecting, analyzing, synthesizing, and improving practice. Digital Tools for Thought (TfTs) facilitate and amplify this work by helping educators externalize, link, and revisit their ideas, reflections, and decisions. This support enables deeper understanding, structured reflection, and continuous refinement of teaching practices, turning competence development into an active, cognitively rich process (see section 3).

Whether analog, digital, or hybrid, the value of any tool depends on how well it is used and how well it supports cognitive processes, reflection, and knowledge structuring. Effective tools for PKM align with individual goals, contexts, and workflows, to enhance rather than complicate academic work. On one side, effective tools should seamlessly support cognition, reflection, and knowledge structuring—*enhancing* academic work rather than complicating it. On the other, many tools introduce initial friction: setup complexity, unfamiliar workflows, or cognitive overhead when integrating them into daily practice. In higher education, these affordances enable not just substitution of traditional tools, but modification and redefinition of the portfolio process itself. Following the SAMR model (Puentedura, 2006), digital TfTs allow faculty to redefine (R) how teaching experiences and competences is documented, curated, and communicated, leaving the substitution (S), augmentation (A) and modification behind (M). That way, TfTs allow transforming the teaching portfolio from a static product into a dynamic, evolving knowledge system.

Ultimately, TfTs allow faculty to move beyond fragmented documentation to integrated, reflective knowledge practices (Siegel & Lohner, 2024). They make invisible aspects of teaching (e.g., decision-making, reasoning, learning) visible, improvable, and shareable, not only supporting high-quality portfolios, but fostering coherent,

sustainable academic professionalization. Ultimately, TfTs allow faculty to overcome fragmented documentation by creating interlinked, searchable, and continuously updated notes that reflect ongoing teaching decisions and reflections (Siegel & Lohner, 2024). By capturing the reasoning behind instructional choices, linking feedback to course design, and embedding reflection into daily work, these tools make invisible aspects of teaching—such as decision-making and learning processes—explicit and traceable. This not only supports the creation of high-quality, evidence-informed portfolios but also can foster habits of structured reflection that contribute to long-term professional development.

3 Teaching Competence and Portfolio Development

3.1 Defining Teaching Competence

The demands on university lecturers are rising and increasingly complex. Designing, enacting, and evaluating high-quality teaching necessitates a comprehensive set of competencies that extend far beyond content delivery. Educational psychology and (higher) education research have long examined what defines teaching competence (König, 2020).

In the German-speaking context, Baumert and Kunter's (2006) teaching competence model remains highly influential in both school and higher education. It conceptualizes teaching competence as a multidimensional construct including: (a) different types of professional knowledge, (b) motivational orientations, (c) professional beliefs, and (d) self-regulatory and self-reflective abilities. Salmhofer (2020), Gruber (2021), and Rhein (2011) emphasize that professionalization involves engaging critically, reflexively, and systematically with one's teaching role and tasks, rather than merely accumulating experiences, disciplinary knowledge, and/or qualifications. Against this backdrop, teaching competence emerges not as a fixed qualification but

as a dynamic, evolving capacity. As van Dijk et al. (2020) demonstrate, expert university teachers (a) work with greater efficiency, (b) assume more complex responsibilities while engaging in deeper reflection, and (c) exert influence across educational contexts. Their development is marked by deliberate practice, contextual responsiveness, and evidence-informed refinement.

Teaching competence cannot be directly observed but is inferred from teaching through performance and evidence-informed artifacts such as annotated syllabi, course designs, student feedback, peer observations, and reflective writing (Seldin et al., 2010). When systematically compiled, teaching portfolios offer a curated, longitudinal perspective on professional development, making visible both educators' actions and their reasoning, improvement, and adaptation over time. Developing this kind of integrated competence demands structured opportunities for reflection, feedback, and application (Patton et al., 2015). Teaching portfolios, especially when supported by intentional and explicit knowledge management practices, serve as powerful instruments for many purposes.

3.2 The Need for Continuous Professional Development

Teaching competence is a dynamic capacity that requires continuous development, impacting student learning and instructional quality (Hoffmann et al., 2024; Merkt, 2016). Effective teaching demands competencies in planning, conducting and evaluating teaching learning. Excellent teachers need to understand, for instance, educational psychology, and be able to reflect and improve autonomously (Kordts-Freudinger et al., 2021). Teacher professional learning is a process, shaped by individual goals, disciplinary culture, and institutional context (Darling-Hammond & McLaughlin, 2011). The development of teaching competencies follows a non-linear, processual, and iterative trajectory. Progress is often incremental. It can take many forms, including formal courses, mentoring, self-study, or peer observation (Desimone, 2011; Stevens et al., 2024). Meaningful development requires changing

habits of thought and action, using tools that support self-regulated learning and sustained, and engaging in evidence-informed reflection (Brookfield, 2017; Gruber, 2021).

Developing teaching competence also is professional identity work. It contributes to teaching profile building, self-efficacy, and a growing sense of ownership and pride in one's teaching achievements and trajectory. Yet understanding, appreciation, and use of development opportunities still vary significantly across individuals, cultural contexts, and institutions (Cordingley et al., 2015). Teaching portfolios are a key tool for this process (see Section 4). When conceived as ever-evolving collections of artifacts, they serve as both mirrors, fostering metacognitive insight; and maps, guiding structured growth (Bräuer, 2016; Scheer et al., 2016). Models like Gibbs' Reflective Cycle (1988) can structure reflection, while writing enables cognitive offloading (Morrison & Richmond, 2020) and higher-level conceptualization (Luhmann, 1992).

4 Teaching Portfolios: Purpose and Structure

4.1 What Is a Teaching Portfolio?

A teaching portfolio is a purposeful, ideally evidence-based collection of materials that illustrates a lecturer's teaching competence, development, and effectiveness (Seldin et al., 2010; Szczyrba & Gotzen, 2012). Rather than being a loose compilation, it is, ideally, a curated, contextualized narrative integrating documentation, reflection, and analysis to provide insight into an educator's pedagogical values, practices, and growth. Typical components include:

- *Teaching Philosophy*: A critically-reflective statement articulating the instructor's beliefs, values, and main approaches to teaching and learning;
- *Course List and Syllabi*: Documentation of courses taught, learning outcomes, and/or (selected) course descriptions;
- *Teaching Evaluations*: Quantitative and qualitative feedback from students, peers, and/or self-assessments;
- *Other Selected Artifacts*: Annotated lesson plans, examples of teaching innovations, developed learning materials, summaries of development activities, or SoTL- and DBR-publications.

These artifacts can demonstrate both the quality and progression of one's teaching (Auferkorte-Michaelis & Szczyrba, 2007; Seldin et al., 2010). Crucially, it is not just the inclusion of evidence that matters, but also its thoughtful interpretation and synthesis into a coherent, artful narrative. While sometimes seen as static, a portfolio should function as a dynamic, evolving system, regularly refined and deepened through reflection. When supported by TfTs and embedded in PKM practices (Siegel & Lohner, 2024), teaching portfolios invite us to reimagine them as dynamic canvases where professional growth, critical reflection, and pedagogical innovation are continually brought to life. Fig. 2 summarizes some facts and myths about teaching portfolios.

Some Myths And Facts About Teaching Portfolios

Aspect	Rather Fact	Rather Myth
Reflection	A strong TP shows achievements, reflection, and contextualisation.	It's just academic fluff – a buzzword exercise in educational jargon.
Fit	TPs must fit you – your goals, context, and institutional requirements.	There's one correct type of TP.
Evolution	A TP evolves – it's never "finished."	It's a static compilation of documents.
Process	The process of creating a TP is as valuable as the product.	Only the product matters.
Growth	Creating a TP can support your personal and professional development.	I do this for the institution, not for me.
Visibility	Making good teaching visible is part of professional practice.	"If I teach well, I don't need to write about it."
Steps	Creating a TP is a stepwise and dynamic process.	It's a Herculean one-time task.

Figure 2: Exemplary Facts And Myths About Teaching Portfolios

4.2 Why Develop a Teaching Portfolio?

A teaching portfolio serves two main purposes: as a tool for formative reflection on one's teaching (developmental portfolio; Bräuer, 2016) and as a summative document for personnel decisions like promotion, tenure, or hiring (presentation portfolio; Fitzpatrick & Spiller, 2010). When thoughtfully developed, portfolios go beyond collecting artifacts; they narrate the process of professional learning and pedagogical reasoning. A robust teaching portfolio reveals not only what a lecturer does, but why and how they teach the way they do, making the invisible aspects of academic teaching visible and improvable (Rasmussen, 2006). Key functions include:

- *Reflection*: Fostering metacognitive engagement with one's teaching identity, decisions, and growth (e.g., Auferkorte-Michaelis & Szczyrba, 2007; Seldin et al., 2010)
- *Integration*: Linking experiences, materials and acquired professional knowledge across courses, semesters, and roles, making the structure of teaching practice visible (e.g., Siegel & Lohner, 2024)
- *Transfer*: Enabling knowledge reuse, support peer learning, and foster the dissemination of effective practices.

From a professionalization perspective, teaching portfolios are central to quality assurance, academic recognition, and institutional development. Increasingly used in hiring and evaluation processes (Seldin et al., 2010), they are integral to reflective and scholarly teaching cultures (Häcker, 2022).

Teaching portfolios also align with broader scholarly and design-based approaches, including Scholarship of Teaching and Learning, design-based research, and empirical evidence. When integrated into PKM systems and supported by TfTs, portfolios become dynamic, evolving, and evidence-informed documents. Importantly, a teaching portfolio is not an academic vanity project, but an essential tool for reflexive practice, scholarly engagement, and structured dialogue among educators.

4.3 Creating Portfolios with Digital Tools

Creating a compelling teaching portfolio is a complex task and process requiring thoughtful decisions about purpose, content, and structure, balancing documentation, reflection, and narrative coherence. Rather than a one-time task, portfolio development is iterative and ongoing. Writing a teaching journal (Hübner et al., 2010) can make learning processes conscious, visible, and revisitable. There is no single correct way to build a portfolio. Format and content should reflect the lecturer's disciplinary identity, teaching philosophy, and development goals, whether aimed at promotion, appointment, or self-directed growth. As Berk (2018) notes, no single source of evidence suffices. A strong portfolio weaves together student, peer, and self-feedback

to demonstrate competence (Brookfield, 2017). Portfolios thrive through intentional reflective writing, generative learning, and self-regulation. While AI tools may assist with language or structure, selecting, contextualizing, and narrating of evidence remain inherently personal and intellectual tasks. Portfolios often develop within academic development programs or mentoring schemes but ultimately remain self-directed projects. Dean (2022) suggests starting with authentic teaching experiences as entry points for reflection. Typical Steps:

- *Select a Format:* Choose a structure that suits your workflow: PDFs, wiki-style sites, or markdown text files, based on digital habits and target audience.
- *Collect Artifacts*: Systematically gather representative materials: syllabi, (annotated) lesson plans, feedback, awards, or educational media.
- *Reflect*: Apply structured models (e.g., Gibbs' Reflective Cycle) to analyze experiences and outcomes.
- *Curate and Connect*: Avoid the *completeness trap* by selecting artifacts that best reflect growth, connecting them with insights and context.
- *Iterate*: Continually update and refine the portfolio alongside teaching practice.
- *Collaborate*: Engage peers, mentors, and students in co-creation and feedback.

Digital portfolio systems (e.g., Mahara, wiki-based platforms, digital gardens) offer multimedia integration (Farrell, 2020). Digital and link-based TfTs go further by integrating portfolio work into daily PKM. When embedded in PKM systems, TfTs enable lecturers to:

- Use templates for documentation (e.g., course descriptions, evaluation summaries);
- Draft and refine teaching philosophies linked to authentic examples;

- Build interlinked structures by connecting syllabi, reflections, feedback, and design decisions and
- Embed reflection prompts and peer feedback into their routines.

A digital and dynamic portfolio aligns with the *digital condition* as described by Stalder (2018) in that it embodies the core characteristics of digital culture: networked, variable, and relational. By creating a digital and dynamic portfolio, individual elements and moments of a teacher's competence growth are made explicit, shareable and embedded in a larger network of academic work. While these portfolios are often stored locally, their modular structure and interoperability (e.g., via markdown, exports into different file formats for online or offline use, or shared templates) make it easier to selectively share insights or connect them to broader academic development efforts when desired.

4.4 Practical Applications

Our approach builds on four interrelated pillars described in the previous sections of this article: (1) Teaching-related PKM; (2) Digital TfTs; (3) Teaching Portfolio; and (4) Teaching Competence Development (see figure 1).

To further illustrate key concepts, we provide two use cases of teaching portfolios brought to life through digital Tools for Thought. These examples, available online as supplementary resources (see Supplements A and B) demonstrate how digital PKM, TfTs, portfolio design, and competence development intersect in practice. Each case is mapped across six dimensions to ensure clarity: goals and content, target audience, purpose and implementation, potential and added value, technical environment, and challenges.

We invite readers to explore these practical applications for strategies and inspiration to enhance their own teaching practice.

5 Discussion

This article examined how PKM, supported by digital TfTs can enhance higher education teaching portfolio development. The core finding is that digital teaching portfolios, when integrated into a PKM system, constitute more than just documentation tools, they become dynamic instruments for reflection, professionalization, and teaching competence development.

5.1 From Static Archive to Dynamic Architecture

The main contribution of our approach lies in *reimagining* the teaching portfolio—not by contesting its conceptual intent as a dynamic tool for reflection and development, but by addressing the gap between its intended purpose and actual practice. In reality, teaching portfolios often remain static snapshots—compiled once for hiring processes, saved as PDFs, or uploaded to institutional websites—rather than evolving resources for ongoing professional learning. Tools for Thought (TfTs) help bridge this gap by enabling modular, interlinked, and continuously revisable portfolio systems that better reflect the dynamic nature of teaching competence development.

This shift reflects the modification and redefinition levels of the SAMR model (Puentedura, 2006). TfTs allow educators to rethink not just their documentation and evaluation, but also to understand, develop, and communicate teaching competence, supporting (collective) professional learning. Compared to conventional ePortfolios (e.g., Mahara, Wikis) or isolated PKM approaches (Reinmann & Hartung, 2013), TfT-enhanced portfolios offer greater customizability, improvement through bidirectional linking, seamless integration with daily academic routines, and support both individual growth and institutional learning.

5.2 Implementation Challenges and Limitations

Despite the potentials of TfT-supported teaching portfolios, their implementation faces substantial challenges, particularly in academic environments where teaching is undervalued or poorly supported. These challenges manifest on both individual and institutional levels.

At the individual level, a major barrier is the potential lack of digital literacy. Many lecturers are unfamiliar with markdown-based note-making applications, metadata structures, or the advanced functionalities offered by some TfTs (e.g., Siegel et al., 2021; Siegel & Lohner, 2024). This often requires an initial learning effort, which can be a barrier, especially for those lacking time, institutional support, or prior experience with PKM. Creating and maintaining a reflective, evolving portfolio requires sustained effort. Yet, in the reality of higher education, documentation and reflection are frequently perceived as extra work. Additional burdens in an already overloaded academic schedule (Brownell & Tanner, 2012). Without individual or institutional incentives, many lecturers deprioritize such efforts. Cognitive overload also poses a challenge, particularly for newcomers to the TfT ecosystem. Managing interlinked, non-linear knowledge systems can lead to disorientation, with tension between micro-level detail and meta-level synthesis, and concerns about separating meaningful structure from digital noise. Moreover, there is a knowing–doing gap: simply documenting knowledge does not guarantee improved teaching. Without critical engagement, reflection, and reapplication, portfolios risk becoming static archives of inert knowledge. This closely links to the challenge of tacit knowledge articulation, the difficulty of making implicit practices and pedagogical reasoning explicit, shareable, and improvable (Neuweg, 2015; Renkl et al., 1996).

At the institutional level, several structural deficits persist. Most higher education institutions still lack systematic strategies, efforts, or infrastructures to support individual and collective PKM. Although research data management and administrative systems are often well-resourced, PKM ist still poorly scaffolded, if not entirely unsupported. This is compounded by evaluation asymmetries: teaching-focused scholarly work, especially when qualitative, reflective, or narrative in nature, is frequently

undervalued in hiring, promotion, or tenure processes (Bahr et al., 2022). In some academic cultures, this leads to perceiving teaching portfolios as *bureaucratic box-ticking* exercises or as *academic busywork* with little career value. Finally, these challenges reflect a cultural stigma: teaching remains widely perceived as the *unloved child* of academia. The production and curation of teaching knowledge, especially in formats that diverge from traditional metrics, are often seen as marginal or secondary to research.

Relevant Tensions to Navigate When Creating A Teaching Portfolio

	Key Tensions	
Personality	How much of "authentic me" is appropriate without seeming unprofessional?	**Professionalism**
Abstraction	How much theory is useful? How concrete must I be without becoming trivial?	**Concreteness**
Self-Promotion	How do I balance strengths and weaknesses without over- or underselling myself?	**Self-Reflection**
Product	When is my portfolio "finished"? Or is it always a work in progress?	**Process**
Reality	How honest can I be when everyday practice diverges from my ideals?	**Aspiration**
Structure	Do I need to follow a predefined format, or can my portfolio be "different"?	**Openness**
Intuition	Do I support my teaching beliefs through implicit / anectodal or scientific evidence?	**Evidence**

Figure 3: Relevant Tensions to Navigate When Creating A Teaching Portfolio

In sum, developing meaningful teaching portfolios is not merely a technical task. It is a cultural, epistemic, and political endeavor. It requires time, recognition, and a supportive institutional ecology to move beyond tokenism and realize its full potential as a driver of sustainable academic development.

6 Conclusion

In this article, we show that teaching portfolios; while conceptually dynamic; gain practical depth and sustainability when supported by systematic PKM and digital TfT. These tools add value by embedding portfolio work into everyday academic routines, enabling structured reflection, interlinking of teaching experiences, and iterative development that traditional portfolio formats often fail to support. Embedding portfolio work within PKM practices enables lecturers to make their thinking visible, document pedagogical growth over time, and engage in deeper, evidence-informed reflection on one own's teaching.

Digital TfTs scaffold cognitive and metacognitive processes by helping lecturers linking, structuring, and synthesizing complex information and knowledge, transforming portfolios from static records into living systems that evolve with educators' expertise. This iterative engagement fosters self-monitoring, pattern recognition, and conceptual refinement; transforming the portfolio into a living system of thought that evolves with the educator's professional learning. Developing a teaching portfolio remains a complex design challenge (Seldin et al., 2010; Bräuer, 2016). It requires balancing institutional expectations with authentic self-reflection, whether to become a critically reflective teacher (Brookfield, 2017) and/or to prepare a tenure-track dossier. Digital environments support this by transforming fragmented documentation into coherent professional narratives, counteracting the marginalization of teaching in higher education (Bahr et al., 2022). While research portfolios often focus on quantitative indicators and measures, teaching portfolios usually provide a qualitative record that values process as much as product. For appointment committees, TfT-supported portfolios support holistic, multicriteria evaluation and align with calls for comprehensive assessment beyond traditional metrics (e.g., DORA Declaration).

Our findings also highlight avenues for further inquiry and practice:

1. Examine how TfT implementations affect reflection depth and portfolio quality.
2. Refine theoretical models linking PKM and teaching competence.
3. Conduct longitudinal research on how TfT-supported portfolios influence careers and teaching effectiveness.

Looking ahead, institutions, academic developers, educators, and researchers must strategically leverage digital TfTs to foster reflective, evidence-informed teaching cultures. Institutions can foster PKM practices free from technological myths by integrating them into existing faculty development structures at different levels of higher education institutions (Brahm et al., 2016). This might include:

- Offer PKM workshops and micro-credentials on digital TfTs.
- Embed portfolio development into professionalization programs.
- Recognize documented reflection and innovation in promotion and evaluation criteria.

By integrating TfT-supported portfolios into individual and organizational development—from lecturer professionalization to institutional learning cultures—universities can build sustainable ecosystems for teaching excellence. As knowledge management evolves (Nakash & Bouhnik, 2021), digital teaching portfolios will remain core infrastructure for academic quality, development, and transformation, reminding us that professional growth in higher education is an ongoing endeavor. In this sense, the future of higher education will depend not only on structural reforms but also on how effectively higher education institutions and faculty cultivates reflective, evidence-based teaching practices through living, evolving portfolios.

7 Supplements A and B

Due to the character restriction of the ZFHE, the two supplements A and B can be found online at:

- *Supplement A*: https://osf.io/wvdrm
- *Supplement B*: https://osf.io/5w8ec

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