

Finding Evidence of Metacognition through Content Analysis of an ePortfolio Community: Beyond Text, Across New Media

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Abstract: Finding evidence of how metacognition is demonstrated in educational ePortfolios is often limited to written artifact analysis and ignores new media such as images, video, links, and navigation schema. This study seeks to begin to fill this gap through a qualitative content analysis of 30 learners' ePortfolios developed in a networked ePortfolio community. We found evidence of learners' metacognition in their choices, integration, and organization of new media content in the ePortfolio. We propose that intentional analysis of learners' choices and arrangement of new media can help educators and researchers find additional evidence of metacognition beyond text within digital learning interventions like ePortfolio communities.

Introduction

Metacognition is a learner's ability to reflect upon and monitor learning activities and strategies, a key factor in successful learning transfer (Bransford, Brown, & Cocking, 2000). Researchers assert that ePortfolio development is valuable for metacognitive development because it helps learners track and reflect on their learning (Blackburn & Hakel, 2006). Evidence of metacognition in ePortfolios is based on analysis of text-based artifacts and reports (e.g., Meyer et al., 2010), but these analyses do not take into account learners' inclusion of new media.

Through a qualitative content analysis of new media in 30 learners' ePortfolios developed in a college-level writing course, we found patterns across learners' choices, integration, and organization of new media ePortfolio content such as images, videos, navigation schema, and embedded forms. These elements reflected metacognition characteristics including situating oneself in a learning community, becoming a writer and navigating the learning process, and valuing writing and learning more generally. We argue that how learners choose to organize their online environments, their choice of new media content, and how they present it can provide evidence of learners' metacognition. Thus, it is important that researchers consider methods for identifying and assessing learning in digital learning environments that take these new ways of demonstrating learning and metacognition into account.

Review of Literature

Metacognition, or knowledge about one's own cognitive processes, is a core learning outcome in liberal education (Ottenhoff, 2011). Learners' ability to understand and analyze themselves as learners and their learning processes leads to strengthened transfer of knowledge and skills (Bransford et al., 2000). Akyol and Garrison (2011) developed a metacognition construct that includes three metacognition components: knowledge of, monitoring, and regulation of cognition (see subset of construct in Table 1 below). For example, when developing writing skills in a writing course, a learner's awareness and understanding of key self-regulating processes like planning, drafting, and revising is a form of metacognition (Perry, 1998). While evidence of metacognition is often elusive in educational situations, researchers have used a variety of methods to identify metacognition in written artifacts and transcripts (Lai, 2011), but the degree to which these accurately assess metacognition is debated (e.g., Pintrich et al., 2000).

Table 1. A subset of Akyol and Garrison's (2011) Metacognition Construct

Knowledge of Cognition	Monitoring of Cognition	Regulation of Cognition
Pre-Task Reflection <ul style="list-style-type: none"> Knowledge of factors that influence inquiry and thinking Knowledge of self as a learner 	Reflection on Action <ul style="list-style-type: none"> Asking questions for confirmation of understanding Commenting about self's and others' understanding 	Reflection in Action <ul style="list-style-type: none"> Procedural; planning Setting goals Providing/asking for support

Technologies that facilitate development of, critical reflection upon, and representations of learning have developed rapidly in terms of their scope and reach. A digital learning environment that researchers claim facilitates metacognition is the educational electronic portfolio ("ePortfolio"). ePortfolios are championed as

tools for learners to analyze, synthesize, and share their experiences inside and outside of school in a way that print-based portfolios could not. A review of the literature on ePortfolios shows that researchers have not analyzed new media specifically for evidence of metacognition; however, new media researchers suggest that an analysis of learners' multimodal artifacts offers insights into learners' identity, understanding, and creative processes (e.g. Halverson et al, 2012).

In previous interviews with learners using ePortfolios, we found that learners had engaged in metacognitive practices (Wozniak & Zagal, 2012). However, we were unsure if there would be evidence of those practices in the ePortfolio itself. In addition, if we were to find such evidence, what form it would take? Our main research question for the current study is: What evidence of metacognition is present in an ePortfolio community? And, considering previous research in this area has focused mainly on learners' written artifacts, we intentionally asked: What evidence of metacognition exists specifically in new media ePortfolio content?

Method

We conducted a qualitative content analysis of 30 learners' ePortfolios developed in a college-level introductory writing course over one term, intentionally seeking evidence of metacognition. The writing course focused on strategies and tools for planning and developing a writing process, researching and integrating sources, organizing ideas into essays that follow general academic conventions, and demonstrating writing proficiency with an ePortfolio. To build their ePortfolios, learners used software with a WYSIWYG page editor with social networking features such as commenting, tagging, and directory search. The instructors directed learners to include course assignments, such as their writing plans and essay drafts, but also welcomed other artifacts and elements and encouraged them to explore all the software features. The instructors gave no requirements for how to organize and label the ePortfolio contents or types of new media elements.

After the course, we conducted a content analysis of 30 learners' ePortfolios (with their consent) to search for evidence of metacognition. Content analysis offers an opportunity to analyze static documentation (usually transcripts) to evaluate deep learning, cognitive skills, and metacognition (e.g., Newman et al, 1995). To look for evidence beyond written artifacts, we conducted a descriptive page-by-page inventory, somewhat like an annotated sitemap, of all new media ePortfolio contents including text, image, embedded documents, forms, video, links, commentary, and organization schema. We then used process coding (Saldana, 2009) to code for places in these descriptive site maps where learners demonstrated metacognition in the form of self-regulation, self-monitoring, and reflections on their learning processes in the writing course. Process coding, a method of coding actions (codes are typically gerunds ending in "-ing"), was useful here because metacognition is often defined with action-based criteria. Our codebook included process codes such as "planning," "demonstrating process," "welcoming comments," and "inviting community." Thus, if a learner chose to embed a contact form on a particular page within the portfolio, we coded this as "welcoming questions and comments" and "inviting community." We analyzed those process codes to identify patterns that suggested manifestations of metacognition in the ePortfolio community.

Findings

Our process codes analysis showed higher-level patterns of behavior in the ePortfolio with the following metacognition characteristics: (1) how the learners *situate* themselves in a learning community, (2) how the learners *understand themselves as learners/writers* and *navigate* the learning process, and (3) what they *value* with regard to learning. Specifically, our process coding revealed higher-level patterns of "situating," "becoming", and "valuing".

A. Situating

All 30 learners chose to include a Welcome page or About Me page as the ePortfolio landing page. Some learners only included text-based signifiers of identity, such as a general greeting, name, age, location, job, and explanation of the purpose of the portfolio. However, other learners also chose to include images, videos, and links that reflected the topic of the course (writing) or some aspect of the learner's identity (see Figure 1). Many learners also added a preset "Contact Me" form or asked visitors to use the default Comment form in their Welcome or About Me page, suggesting that a form of contact should not be an afterthought, but a first consideration for the audience. One learner stated in his portfolio, "As a techie, [this portfolio] really allows me to have fun in creating it but also as a place to see my work in an open space where others can comment as well for great feedback." Another learner chose to make a commenter's message public, that of her teacher, and points it out to her audience: "I am also including feedback from my professor for the essay drafts to show the progression of my writing."



Figure 1. Images and videos that reflect the course topic and learners' identities as learners and professionals.

By choosing to include these elements in their "Welcome" and "About Me" pages, learners situated themselves in the learning community in non-textual ways. Instructors did not require learners to include a Welcome/About Me page, integrate new media elements reflecting their identities as learners, or invite the community to connect with them and join them in discussion about the ePortfolio contents. We believe learners' intentionally chose to include new media elements in this way because not only are they conventional elements for other digital representations of self such as personal homepages and social media, but also because these were common elements they identified in other learners' ePortfolios in the system through the directory. Yet, their unique choices of new media content for these pages gave them an opportunity to show others what they valued and could contribute, and what they wanted from the community in return. This is a metacognitive characteristic that shows learners intentionally and independently thinking about the discipline of writing, building their ethos, and recognizing what it takes to enter and situate oneself in the larger learning community.

B. Becoming

How a learner decided to organize and label new media in the ePortfolio was evidence for how they were "becoming" writers and reveals, symbolically, how they "navigate" their own learning. The type and organization of the ePortfolio menu items reflected their process as writers and their intentions to move from novices ("First Drafts" or "Start of the Term") to experts ("Final Drafts" or "End of the Term"). Even if learners were reiterating the order of assignments in the course syllabus, or following the structure they saw in another portfolio, their deliberate choice to "re-mix" the labels and organization of the pages in this way demonstrates metacognition because they recognize and take ownership of strategies inherent and important in the expert writing process.

Additional evidence of learners' move from novice to expert, a process of "becoming," was seen in their choices and arrangement of new media in the context of their early assignments compared to their final assignments. Learners included quotes, images and videos about writing from perceived authorities (authors, scholars) with early assignments. In final assignments, they generated their own quotes or theories on writing, as "emerging authorities," with supporting images and video (see Figure 2). For example, on her Welcome page, a learner quoted a professional writer and, on her "Goals" page, she linked to a video, "Writers on Writing". Later, she writes in her final reflection, "I was able to reflect on my ability to target my audience, identify my writing task, and effectively reach the goal of my writing. I then concluded that I am a writer." While some of these reflections were assigned, learners' decision to post and place them in specific locations within the portfolio demonstrates their recognition of self-monitoring in learning as well as a community that values this type of reflective practice or reflection-in-action.



Figure 2. Images and videos show learners' thoughts on being a writer and aspects of the writing process

C. Valuing

Learners signaled what they valued in their learning experiences in the format and topics of the essay drafts they posted in the ePortfolio. In more than half of ePortfolios, learners cut and pasted their drafts from Microsoft Word docs, did not change the format (including the MLA paper heading of name, date, instructor at the top), and only sometimes provided context for how a particular draft or set of drafts made a contribution to their learning or the learning community. We took this lack of "re-mediation" as a sign that learners were appealing to the requirements for the course. They completed tasks that mattered to the teacher with little focus on

connecting or building a community through representations of their identities and experiences as we saw in the About Me/Welcome pages.

On the other hand, after exploring other elements of the learners' portfolios, it became apparent that the topics of the essay drafts often reflected something related to the learner's interests and, in a few cases, connected to signifiers of identity in their About Me and Welcome pages. Many of the essay assignments in the course encouraged learners to write about something that interests them or with which they had experience, and a few learners did make these connections explicit for the community in the digital environment of the ePortfolio. They did this by adding reflective statements at the top of pages that connected one page to the next, removing print-based formatting elements like headings, embedding links to information on the web when relevant in the body of their writing, and embedding images that support the content of their essays, all without guidance from the instructor.

Discussion

This content analysis shows how learners revealed, beyond text and across new media, their situation in a learning community, learning process, and understanding and value of a discipline (writing, writers). Analysis beyond textual content—specifically an inventory, coding, and thematic analysis of learners' choices and arrangement of new media—can help educators and researchers find additional evidence of metacognition within learning environments like ePortfolio communities. For example, those seeking evidence of metacognition in learner-controlled environments such as course wikis or learner blogs can pay special attention to learners' new media elements such as menu item labels, navigation schema, and the location and type of embedded images, videos, and forms.

Finally, while this study focused on finding *evidence of metacognition*, not an *assessment of the strength of metacognition* demonstrated in the ePortfolio community, we felt the connection between identity as a learner, the learning experience, and the community was often underdeveloped. This suggests the need for an intentional, long-term approach to metacognitive development in the classroom and within learning communities such as this one. A few learners demonstrated strong metacognition through the creation, organization, and integration of ePortfolio content and their connection with the online community, so we hope that researchers and educators continue to explore approaches to metacognitive development with a focus on learners' creation and arrangement of new media elements in identity construction and collaborative learning environments.

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