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## Use of ePortfolio as Integrated Learning Strategy in Computer Integrated Manufacturing Online Course

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Dr. Jovanovic received her dipl.ing and M.Sc. in Industrial Engineering from University of Novi Sad, Serbia. She received a PhD in Technology at Purdue University, while working as a PhD student in Center for Advanced Manufacturing, Product Lifecycle Management Center of Excellence. Dr. Jovanovic is currently serving as Assistant Professor of Engineering Technology, Frank Batten College of Engineering and Technology at ODU. She is teaching classes in the area of mechatronics and computer aided engineering. Her research interests are: mechatronics, digital manufacturing, product lifecycle management, manufacturing systems, and engineering education.

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Megan Mize is currently a Doctoral Candidate in English Studies at Old Dominion University, pursuing the Literary/Cultural Studies and Rhetoric concentrations. Her dissertation, *Constructing an Early Modern Queen: Gender, Authority, and the Rhetoric of Identity*, explores the intersection of the history of female educational models and mimicry as a rhetorical strategy for Elizabeth I. As a Special Projects Graduate Research Assistant, she has served on the Quality Enhancement Planning (QEP) Board and University ePortfolio Committee (2011-13), worked as a facilitator for pedagogical workshops, and designed, implemented and assessed several pilot studies connected to the evolving ePortfolio initiative within the English Department. In 2014, she served as the ePortfolio Learning Coordinator for the Honors College. Currently, she works as the ePortfolio Training and Support Coordinator for Academic Enhancement, focusing on faculty professional development in regards to critically incorporating digital tools into course and curricular design.

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Rochelle (Shelley) Rodrigo is Visiting Assistant Professor in the Department of English at the University of Arizona. She researches how "newer" technologies better facilitate communicative interactions, specifically teaching and learning as well as co-authoring three editions of *The Wadsworth Guide to Research*, Shelley also co-edited *Rhetorically Rethinking Usability* (Hampton Press). Her scholarly work has appeared in *Computers and Composition*, *C&C Online*, *Teaching English in the Two-Year College*, *EDUCAUSE Quarterly*, *Journal of Interactive Technology & Pedagogy*, *Enculturation*, as well as various edited collections. In 2014 she was awarded Old Dominion University's annual Teaching with Technology Award, in 2012 the Digital Humanities High Powered Computing Fellowship, and in 2004 the American Association for Higher Education's Patricia Cross Future Leaders Award.

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International Education Award at ODU and Ben Sparks Medal by ASME. He is active in ASME, ASEE, SME and SNAME. Dr. Verma continues to serve the Hampton Roads community in various leadership positions.

# **Use of ePortfolio as Integrated Learning Strategy in a Computer Integrated Manufacturing Online Course**

## ***Abstract:***

Integrated learning is a vital strategy for engaging undergraduate Engineering students in the higher levels of learning, as it encourages students to reflect on their learning processes and draw connections between course-work and “real-world” experiences. Specifically, ePortfolios encourage novice engineers to consider their learning processes over time, drawing connections between coursework and their intended profession, as well as cultivating an online identity that supports their efforts to pursue a career in Engineering. The use of ePortfolios is one method for fostering integrative learning, focusing on the application of digital communication and assessment and awareness of self- competence. By training students to archive digital artifacts related to their learning, ePortfolios encourage student to draw connections between course content and their future careers. Digital portfolios also provide students with the opportunity to develop an online presence, demonstrating through multi-modal content the skills they gained through their education. At the same time, students develop basic digital literacies, from creating and curating digital artifacts throughout the learning process, managing their data, to displaying knowledge and skills which are important for their future engineering careers. This paper examines the efforts of students at Old Dominion University (ODU), Norfolk, Virginia who created ePortfolios in a variety of contexts, as a part of a course which was specifically developed as part of a university-wide ePortfolio initiative. In May 2015, faculty attended a professional development workshop, “eP3: Praxis, Process, and Production,” in order to learn about basic ePortfolio strategies and ways in which to foster students’ archival habits. The project presented in this paper was established in the summer 2015 semester in the undergraduate course “Computer Integrated Manufacturing” at the senior level.

## **Introduction**

ePortfolios are a direct descendant of reflective print portfolios traditionally used in college writing programs and teacher education programs (Ashikin, Ruhizan, & Rohani, 2015; Kahn, 2014). ePortfolio may be defined as a personal and digital collection of artifacts which can include various demonstrations of skills, links to the resources and personal accomplishments in variety of contexts (Lorenzo & Ittelson, 2005). Another definition of ePortfolios describes them as “the product, created by the learner, a collection of digital artifacts articulation experiences, achievements and learning” (Gray, 2008). It presents someone’s ideas, evidences, reflections and feedback through an assembly of digital artifacts (Yastibas & Cepik, 2015). This purpose-centered process allows a student to present his or hers ability or to document the learning process, actively demonstrating that learning has happened (Koraneekij & Khlaisang, 2015; McCready, 2007). One

of the main reasons that they are implemented in courses is that they can facilitate and document authentic learning experiences by: focusing on competencies and outcomes as central features in curriculum, emphasizing building student skills related to the technological literacy, encouraging students to be “big-picture thinkers” and “critically engaged doers” (Reese & Levy, 2009).

### **Applications of ePortfolio in Learning**

Increasingly, courses and programs across the university are integrating ePortfolios into their design, weaving this approach into the fabric of the learning experience. For instance, ePortfolios are commonly used in English language teaching (ELT) courses, as a part of writing skills assessment; recently, the possibility of incorporating ePortfolios into speaking courses has also been explored (Yastibas & Cepik, 2015; Yastibas & Yastibas, 2015). Other applications are noted in performing arts education, such as history of music classes (Dunbar-Hall, Rowley, Brooks, Cotton, & Lill, 2015), health sciences (Endacott et al., 2004; McCready, 2007), or foreign language education (Tanaka, Yonesaka, & Ueno, 2015). The application of ePortfolios in higher education has been consistently increasing since 2010 through campus-wide initiatives; the word is spreading to the faculty, advisors, and career services staff (Ambrose, Martin, & Page Jr, 2014; Kahn, 2014). Recently, ePortfolios are gaining more attention in the engineering curriculum (Alam, Chowdhury, Kootsookos, & Hadgraft, 2015).

Many students recognize that ePortfolios allow them to determine where they stand in terms of their career goals and to check how much they have learned about some new process (Yastibas & Cepik, 2015). Others reported an improvement in decision-making, goal-setting, and planning skills (Ambrose et al., 2014). Furthermore, the application of ePortfolio in undergraduate courses improves students' career planning efforts, professional development, and future marketability (Cheng, Chen, & Yen, 2015; Lin, 2008; Reese & Levy, 2009). As the students is ready to enter the the job market, ePortfolios assist student advising and career counseling, help faculty write robust and specific letters of recommendation, and enable prospective employers to review someone's experience and skills more effectively (Ambrose et al., 2014; Reese & Levy, 2009).

However, ePortfolios can challenge both students and teachers since their successful application is related to the students' technology proficiency (Yastibas & Cepik, 2015). Another potential obstacle arises when considering that students might not share the instructor's attitude regarding the value of ePortfolio assignments (Yastibas & Cepik, 2015). Finally, some students reported that employers were not necessarily interested in reviewing their ePortfolios (Reese & Levy, 2009). While it is significant to note these potential drawbacks, it is important to examine the impact of ePortfolios in an Engineering classroom, in order to consider the possibilities such a strategy may offer for transforming the way students learn course content and prepare to enter their professional field.

## **Integrative Learning**

ePortfolio can serve as a student-centered assessment tool, actively engaging students in the learning process (Cheng et al., 2015). Portfolios emphasize learning by doing teaching strategy and reflection as evidence of students' capacity for critical thinking, analytic reasoning and integrative learning (Rhodes, 2011; Yastibas & Yastibas, 2015). ePortfolios assist efforts related to transformations of models related to the student engagement, success, retention and graduation rates by enabling integrated learning environment and learning across the curriculum (Gambino, 2014). Students are asked to make connections between their acquired knowledge and their learning outcomes as being reflective practitioners who assess where they are in the process of learning (Gambino, 2014; Oakley, Pegrum, & Johnston, 2014).

## **Courses and ePortfolios**

Currently, the application of ePortfolio as a teaching and learning strategy within Engineering programs tends to be isolated to a handful of courses (Alam et al., 2015). They are sometimes used as evaluation and assessment tools for engineering labs, e.g. computer science engineering courses (Macias, 2012). Moreover, ePortfolios as a formative and continuous learning assessment tool may be useful in large engineering courses. Continuous learning is one of the ABET accreditation objectives and often it is the hardest one to measure, especially in classes with hundreds of students. This is very typical for universities with first year engineering programs which have lectures for hundreds students at the same time and very high student per professor ratio. One example of such a course can be Mechanics (Mora, Sancho-Bru, Iserte, & Sánchez, 2012). ePortfolios could be designed to help assess formative, continuous, and transfer of learning in courses with a large number of students, as well as for assessing graduate engineering programs (Kajfez et al., 2013), or supervision of final engineering projects (Filella et al., 2012).

Furthermore, ePortfolios can document experiential learning and research-based learning through online engineering labs through cloud-based personal learning environments (Terkowsky, May, Haertel, & Pleul, 2013). One such environment was used in Computer Integrated Manufacturing senior elective course at Old Dominion University, Norfolk, Virginia, presented in this paper.

## **ePortfolio Initiative at Old Dominion University, Norfolk, Virginia**

Portfolio pedagogy is not new, though it is currently undergoing a transformation as researchers and instructors consider the possibilities and implications offered by emerging digital affordances. As such, best practices have long been identified in terms of formative and summative portfolio assignment design. However, while such practices might be readily available, few faculty not focused on teaching and learning research are exposed to these strategies.

ePortfolio scholarship does not typically emphasize continued faculty support or assessment of faculty support and implementation. Scholars recognize that faculty training to teach with technology must be ongoing—one time training does not suffice. Morgan (2003) argued that faculty needed to be trained for both “initial adoption” and “expanded use” (p. 10). Recognizing that faculty needs may vary, Gold (2005) suggested using technology assessment surveys/tools to assess faculty and then base technology training on data provided from faculty.

Emphasizing building archive portfolios and formative reflection and assessment to help scaffold student learning, the “eP3: Praxis, Process, & Production ePortfolio” professional development workshop at Old Dominion University, Norfolk, Virginia was offered in May 2015 to help faculty implement ePortfolio pedagogy into their summer or fall 2015 courses.

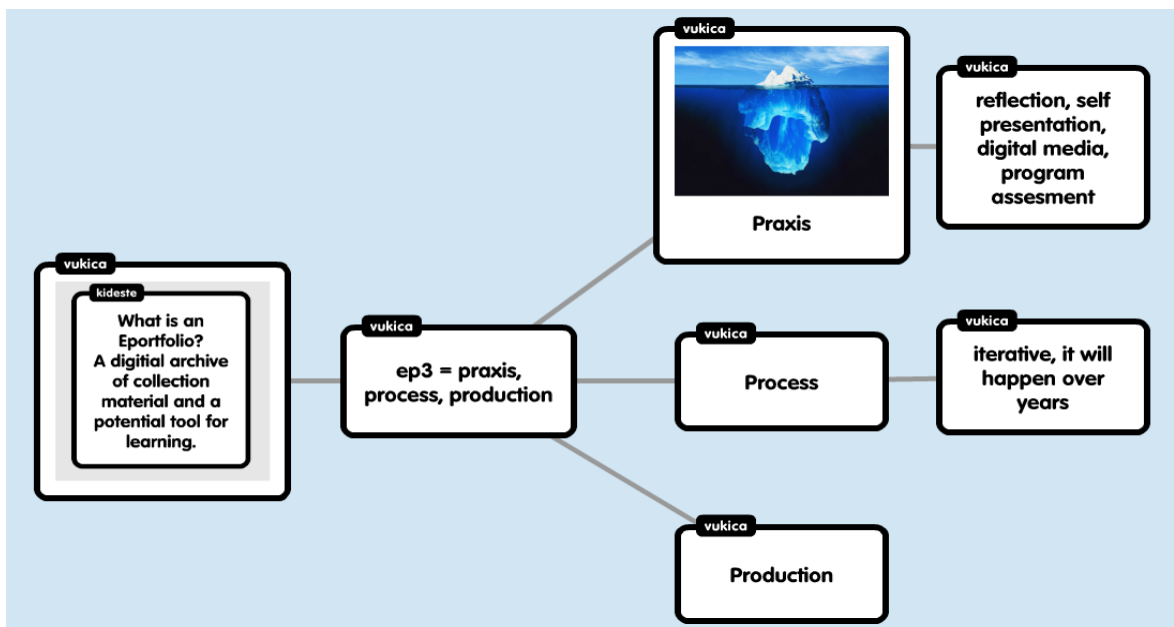


Figure 1: eP3 initial assignment

The workshop template is based on the university’s successful Quality Enhancement Plan: the “Writing Across the Curriculum” workshop. The workshop was three full days; asking faculty to map out their course curriculum, experiment with and design multimedia learning activities, as well as develop their own archive and presentation portfolios. Figure 1 shows a Popplet (digital mind/cluster map application) of the first assignment given to faculty to describe with graphics how they perceive what the ePortfolio process entails. This assignment demonstrated to instructors the need to develop learning activities that would both allow students to demonstrate growth as well as provide visually engaging artifacts for a future ePortfolio. For assessment purposes, workshop participants were asked to have students develop ePortfolios with at least one summative reflection letter at the end of the course. Participants were heavily encouraged to develop formative reflections that scaffolded students towards the final summative reflection. Participants were asked

to use the Association of American Universities and Colleges Integrative Learning Value Rubric (AACU, 2010) to guide the design and assessment of their ePortfolio reflection assignments.

The first such workshop had 28 participants from a variety of disciplines and departments across the university. Participants were asked to map their course objectives with what kind of assignments are given to students to assess these objectives. One example is given in Figure 2 for module Manufacturing Operations.

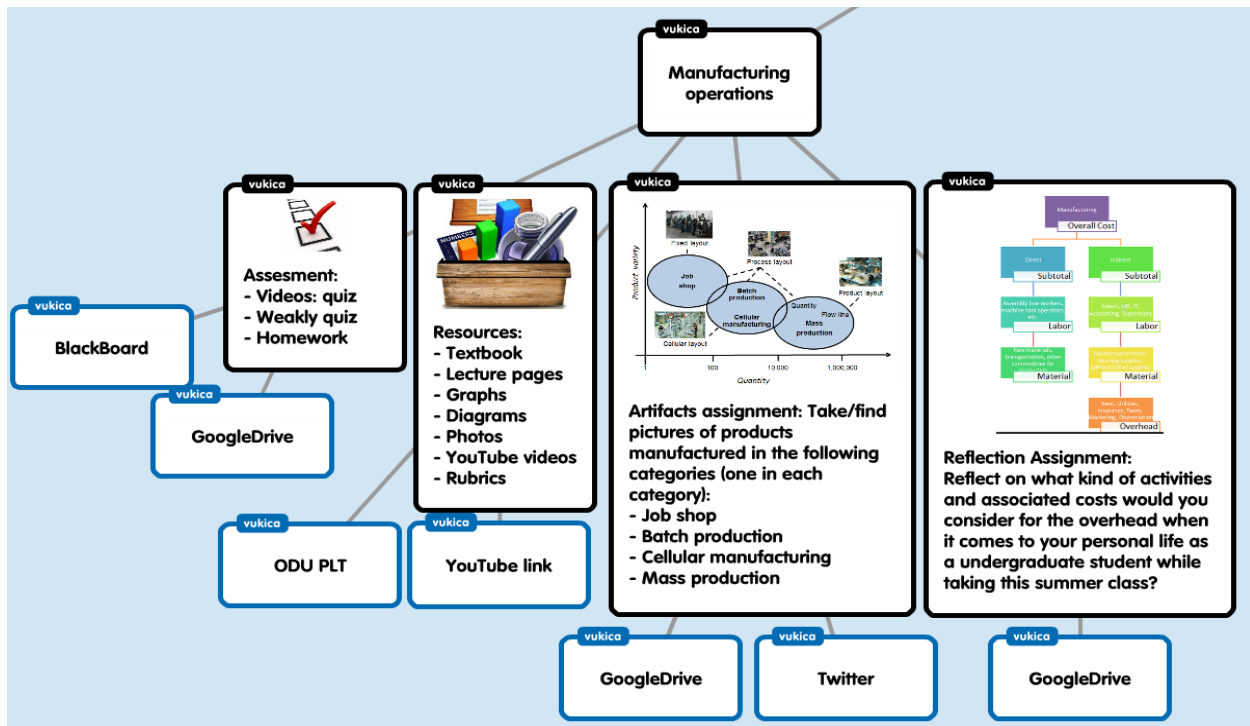


Figure 2: Popplet of Manufacturing Operations objectives mapping

To continue fostering a community of practice related to ePortfolios among the faculty and help programs design and implement curricula that incorporate ePortfolios, the university continues to offer the three-day workshop each semester, in which participants learn about ePortfolios as pedagogical tools. On average, each workshop trains 20-25 instructors. By creating a digital archive of their experiences in the professional development events, participants practice participating in a portfolio pedagogy that promotes active and integrative learning as well as digital literacy skills. Through monthly meetings, monthly newsletters, weekly Open Labs, workshops, and appointments with the ePortfolio Training and Support Coordinator, the participants are supported throughout their initial semester of implementation, and beyond. This support is offered in tandem with Academic Enhancement's Academic and Digital Coaches, peer mentors responsible for supporting students participating in courses and programs using ePortfolios.



## Integrated Learning in Computer Integrated Manufacturing Asynchronous Course

The course Computer Integrated Manufacturing was offered as asynchronous (online) course in summer 2015. It had 38 enrolled students. Figure 3 presented strategies used for Module 1 - Course Introduction; the image demonstrates the need to connect learning activities to learning objectives as well as think about where the learning artifacts are housed for eventual retrieval and use in a future ePortfolio. The first integrated learning strategy for building an online learning community was an introduction and goals audio postcard created in Soundcloud or FotoBabble with hashtag # MET445. Students were asked to upload their photo and record an introduction to themselves and what they expected from the course. This assignment both helped them to build an online community since they could not see one another in class as well as provide an original set of course goals they could use later in the course while reflecting upon what they had learned.

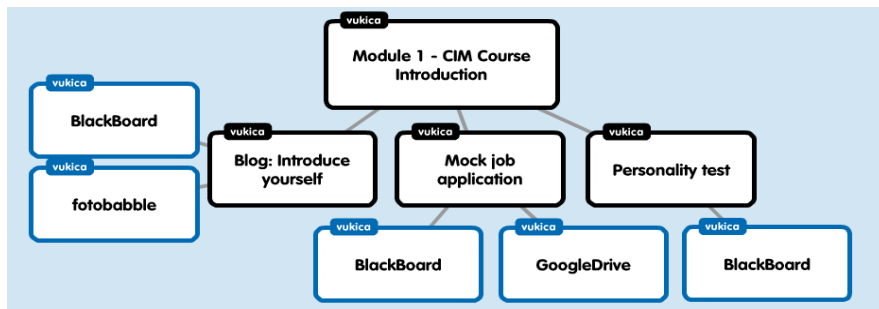


Figure 3: Popplet of CIM course introduction and online strategies used

To meet the assessment requirements of participating in the eP3 workshop, the instructor of this senior elective course created instructions which guided students through creating ePortfolios. The instructions were adopted and adapted from eP3 workshop support materials. Students were given links to university resources related to ePortfolios, examples of existing student ePortfolios, and a copy of the AACU Integrative Learning rubric, as shown in Figure 4.

### Module 12

#### Final Project (e-Portfolio) & Final Exam

- e-Portfolio Basics
- ePortfolio Creation Tools
- e-Portfolio Examples

Figure 4: Module for e-Portfolio in PLT environment for CIM course

Students were also given links for YouTube videos created by software companies or other universities which provide instructions for how to create ePortfolio with the following platforms: Google Sites, WordPress, Wix or Weebly online website creation tools, as shown in Figure 5.

Topics **ePortfolio Creation Tools**

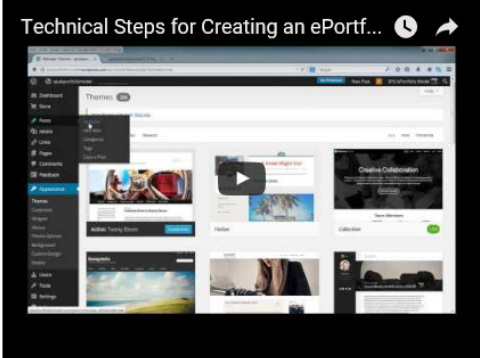
1. [ePortfolio Using Google Sites](#)
2. [ePortfolio Using WordPress](#)
3. [ePortfolio Using Weebly](#)
4. [ePortfolio Using Wix](#)

Page progress - Overall: 5/12 - Topic: 2/6

## EPORTFOLIO USING WORDPRESS

**Activity**

Watch the following YouTube video: Technical Steps for Creating an ePortfolio Using WordPress



The image shows a screenshot of a YouTube video player. The video title is 'Technical Steps for Creating an ePortfolio Using WordPress'. The player interface includes a play button, a progress bar, and a share icon. The video content shows a WordPress dashboard with various menu items and a central area displaying a video player and some text.

Figure 5: e-Portfolio Creation Tools in PLT environment for CIM course

This ePortfolio assignment focused on the following student learning outcome (SLO) for the CIM course: An ability to apply written, oral, and graphical communication in both technical and nontechnical environments. The Integrative Learning Value Rubric (AACU, 2010) was used for grading of ePortfolios in CIM course. There were 29 students enrolled in the course. Twenty six of those students completed the ePortfolio assignment. Twenty five of the students who submitted an ePortfolio pass the ePortfolio assignment with a C.

### Conclusion

Student feedback was mixed. Some students did not care for the Fotobabble assignment nor having to submit it to Twitter, but they did agree that it probably was an effective way to learn about other individuals in an online forum. A more significant issue was that some students did not feel comfortable sharing material in any form on the internet (including the reflection assignment nor ePortfolio). For instance, one student felt so strongly about this that he submitted his ePortfolio without his name. Such students expressed concerns regarding the security of cloud platforms such as Google Drive, even though they were given tutorials on how to make their ePortfolio material accessible only to their instructors. At this institution, by default, once shared via a link, material stored in Google Drive is accessible by only individuals with university accounts. If students want an artifact to be public or even more private, they would need to change the settings. After the ePortfolio project was implemented, 8 % of students enrolled in this class were not comfortable sharing data in any form of online medium at all, including the Google Drive which can be shared only with the instructor and the student. For that purpose, next time that this

class will be offered an alternative digital ePortfolio needs to be provided, an alternative assignment has to be developed, and/or more time needs to be spent helping students understand where and how to adapt the security and access settings for their ePortfolios.

Based on the results from this implementation, as well as some scholarship, instructors who are planning to embed ePortfolio project in their courses should introduce the ePortfolio project as early as possible. Students should have examples of good portfolios and links to resources which would help them learn the web site building tools such as Google Sites, Wix, Weebly or some other which they would use for their ePortfolios (Joyes, Gray, & Hartnell-Young, 2010). Syllabus should include a statement about the importance of this assignment and a grading rubrics; students need to know both the short-term (Johnsen, 2012; O’Keeffe & Donnelly, 2013; Wuetherick & Dickinson, 2015) and long-term benefits of learning through ePortfolio production (Gaitán, 2012; Whitworth, Deering, Hardy, and Jones, 2011). Student should be also allowed to ask for the feedback from the instructor and maybe from their peers so that they could improve their final product before submitting it at the end of the course. An additional assignment has to be offered for students that are not comfortable with sharing anything online. One possibility is to create a paper based portfolio which would have to include everything that online version would have to have. Another alternative may be a standalone slideshow with the same content. Both of these alternatives would still be able to meet both the course SLO as well as the criteria of the ePortfolio grading rubric (the AACU (2010) Integrative Learning VALUE rubric).

The instructor who was teaching this course found this experience very refreshing since she learned about various student perspectives which would not usually be discussed in class, especially in the solely online setting. While working with students from that course, the instructor finds it much easier to write letters of recommendation when she has access to their ePortfolios. In Fall 2015, the instructor had some returning students from the Summer 2015 cohort; she gave them an extended ePortfolio assignment. The extended portfolio assignment allowed the instructor to see learning progression and improvement in their revised ePortfolios.

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