

Changing Their Mindsets: ePortfolios Encourage Application of Concepts to the Self

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We describe the ePortfolio delivery of a mindset intervention to college students. In Study 1, 38 underrepresented ethnic minority (URM) students who were enrolled in a summer research program completed a mindset intervention as a worksheet (n = 17) or as an ePortfolio (n = 21). Students who completed ePortfolios were more likely than students who completed worksheets to demonstrate conceptual mastery, describe a shift in mindset, and describe personal grit. In Study 2, students in an introductory college course completed the mindset intervention in a graded ePortfolio (n = 54) or a graded paper (n = 56). Students in both groups reported a stronger endorsement of a growth mindset after completing the assignment and were equally likely to produce complete answers. Although students who completed papers provided more conceptual content, students who completed ePortfolios were more likely to describe themselves as having a growth mindset and displaying grit than students who completed papers. Positive effects of the ePortfolio intervention were present for both URM and non-URM students. We conclude that ePortfolios add value to assignments that are intended to evoke personal reflection and application of core concepts to the self.

Given mounting evidence linking pedagogically-aligned ePortfolio creation to outcomes that have been associated with high-impact practices, ePortfolio practice was recently added to the list of high-impact practices (Eynon & Gambino, 2017; Watson, Kuh, Rhodes, Penny Light, & Chen, 2016). When implemented well, high impact practices foster deep and integrated learning and have been found to be especially helpful for underrepresented ethnic minority (URM) students (Finley & McNair, 2013). At the core of ePortfolio practice is an emphasis on students' reflection about what they are learning and how they are learning. Watson et al. (2016) suggested that ePortfolio practice might be most effective when used as a *meta high impact practice*. That is, the ePortfolio can be used to encourage reflection on learning that takes place while students are involved in other high-impact practices. Bass (2012) saw ePortfolios as a means by which the formal curriculum can be joined with the experiential co-curriculum by infusing classes with high-impact practices. ePortfolios can enable high-impact features to be incorporated, perhaps even with stronger impact, in larger classrooms (Singer-Freeman & Bastone, 2016). Given the power of ePortfolios, psychological interventions that are delivered via ePortfolio assignments might have increased efficacy. The current work directly compares student responses to the same intervention in different delivery formats in order to isolate the unique benefits of ePortfolio practice.

ePortfolio use in higher education has become increasingly prevalent (Rhodes, Chen, Watson, & Garrison, 2014). Educators' interest in ePortfolios is driven by the belief that ePortfolios may evoke unique responses from students (Buyarski & Landis, 2014). ePortfolios have been found to promote learning and retention of core principles (Singer-Freeman &

Bastone, 2016) and to encourage active learning (Yancey, 2009; Wang, 2009). Buzzetto-More (2010) found that 88% of students who created an ePortfolio believed that it encouraged them to think about what they had learned. ePortfolios also appear well-suited to helping students develop future goals and academic roadmaps (Hubert, 2013). Eynon, Gambino, and Török (2014) found that ePortfolio use correlated positively with student success indicators and helped advance and support deep thinking, integration, and personal growth. The creation of ePortfolios has been found to help students develop academic identity, future orientation, and a sense of belonging to a community of scholars (Nguyen, 2013; Singer-Freeman, Bastone, & Skrivaneck, 2014, 2016).

There is some evidence that ePortfolios are more likely to evoke personal reflection than similar work completed in other formats. Jordine (2015) found that students who completed ePortfolio projects evidenced higher levels of engagement and work quality than did similar students who completed traditional projects. Bowman, Lowe, Sabourin, and Sweet (2016) found that students who created paper or electronic portfolios were aware of the benefits of documenting their development. However, students who created ePortfolios demonstrated better understanding of the assignments' connections to their learning than students who created paper portfolios. It seems that ePortfolios have the potential to focus student attention away from lower-order learning of facts and towards higher-order learning of concepts.

In sum, research findings have demonstrated that ePortfolios can support deep learning and student success when ePortfolio practice is aligned with the curriculum and includes reflective practices. However, there is also evidence that ePortfolios do not always

lead to increased reflection or deep learning. For example, Bate, Macnish, and Skinner (2016) found that medical students did not value the opportunity to create an ePortfolio that included a series of unrelated assignments that lacked reflective content. Interestingly, even when ePortfolios are intended to include reflection, not all students will engage with their work in this way without explicit support. In fact, Blakely (2016) found that only 25% of ePortfolios that were created as part of an introductory course evidenced a deep approach to learning. Thus, it is essential that students are explicitly encouraged to focus on the developmental trajectory of their learning and to build connections across the information they have learned. With appropriate pedagogies and assignments, Blakely (2016) concluded that deep approaches to learning will occur and that ePortfolios can serve as “the space and the occasion for such an examination” (p. 145). Bokser et al. (2016) suggested that adding markers to prompt specific types of metacognition and promote reflection is a best practice that should be used to ensure that students benefit fully from the creation of ePortfolios.

Reflection *is also hypothesized to be* the primary mechanism of change in brief psychological interventions (Powers et al., 2015). Brief psychological interventions utilize prompts that invite metacognition as a means of fundamentally changing the way individuals view themselves and the world. Students are provided with a different way of characterizing their experiences that supports more resilient responses to future challenges. Like high impact practices, brief psychological interventions have been shown to improve students’ grades, persistence, and overall well-being for long periods of time (Walton, 2014). Some schools have begun to incorporate brief psychological interventions as part of student orientation. The classroom is another environment in which interventions could be introduced successfully (Boaler, 2013). Because of their reflective nature, ePortfolios have been proposed as an ideal mechanism by which brief psychological interventions could be incorporated into large classes (Singer-Freeman & Bastone, 2016).

One powerful and widely-used brief psychological intervention is designed to change students’ views of intelligence. Unfortunately, many students enter college with a fixed view of intelligence (i.e., believing that intelligence is genetically determined and unchangeable). Dweck (2006) pioneered work in which brief lessons on brain plasticity led to shifts in students’ views of intelligence. When students are taught to take a growth view of intelligence (i.e., believing that intelligence will increase with effort), they become more interested in attempting difficult tasks and more likely to persist after an initial failure (Paunesku et al.,

2015). The determination to achieve long-term goals and a willingness to persevere in the face of obstacles has been termed grit (Duckworth & Gross, 2014). Duckworth, Peterson, Matthews, and Kelly (2007) have found that having grit increases individuals’ success in a wide range of challenging situations. Given the strong research support for the importance of grit, it is not surprising that many interventions are currently being tested to develop grit in students. Nearly all of these interventions seek to develop both grit and a growth mindset (Snipes, Fancsali, & Stoker, 2012). This grouping reflects the related nature of these two constructs. The positive effects of a growth mindset on grit have been replicated in many domains of learning and across many groups (Boaler, 2013).

Growth interventions have been successfully implemented in psychology, biology, education, sociology, child development, and neuroscience classes (Singer-Freeman & Bastone, 2016; Snipes et al., 2012). d’Erizans and Bibbo (2014) hypothesize ePortfolio practice can itself encourage a shift toward a growth mindset. In the current work, we compare students’ responses to a growth mindset intervention that was completed as part of a graded or ungraded ePortfolio, as an ungraded handwritten worksheet, or as a graded typed paper. We hypothesized that: (1) ePortfolio assignments would evoke more reflection than assignments completed in other formats; (2) growth mindset interventions would evoke reflection; (3) typed assignments would evoke more content than handwritten assignments; and (4) participation in the intervention in any format would result in a shift towards a growth mindset and expressions of grit. We explore the first three hypotheses in Study 1.

Study 1

Method

Participants. This study used a convenience sample. All participants were community college students in a summer research program at a four-year public college. The program served students who are from URM groups, have demonstrated financial need, or are first generation college students. All students complete at least one year of full-time study at a community college before attending the summer research program. Our sample included 38 students (16 students who identified as Latino, 15 African American, four Caucasian, two Asian, and one Native American). Twenty-four students were first-generation college students; 24 students were female and 14 male. The students’ average age was 20.61 years ($SD = 0.48$). Students in 2015 completed a worksheet version of the intervention, and students in 2016 completed an ePortfolio version of the intervention.

Table 1
*Number of Words Produced in Response to Concepts, Reflection, and
 Planning Prompts in ePortfolios and Worksheets*

Measure	Worksheet <i>M (SD)</i>	ePortfolio <i>M (SD)</i>	<i>M</i>
Concepts	36.65 (16.65)	91.10 (39.32)	66.74
Reflection	72.12 (25.50)	142.48 (73.05)	111.00
Planning	30.24 (15.79)	80.48 (91.25)	58.00
Total words	139.01	314.06	

Procedure and Materials

Mindset intervention. Students watched a TEDx Talk by Eduardo Briceño (2012) that defines growth and fixed mindsets and describes research findings demonstrating ways in which a growth mindset is associated with productive responses to academic challenges. The talk concludes with suggestions of ways to develop a growth mindset. In 2015, the students watched the talk together and then responded to questions on a worksheet while sitting in a large lecture hall during the first week of the program. In 2016, students watched the talk alone after the spring orientation and completed typed responses to be incorporated into their ePortfolio. Both years the assignment was ungraded but required. Students did not receive feedback on their responses to the assignment during either summer. Both groups responded to the following prompts: (1) Describe three differences in the ways individuals with fixed and growth mindsets approach learning that were described by Briceño; (2) Reflect on your own life. Do you believe you generally view intelligence as fixed? Describe some of your reactions to academic struggles. Assess the extent to which these reactions are employing a “fixed mindset voice.” Propose some responses you could use that would help you to establish a growth mindset. If you prefer you can answer this question thinking about someone you know well rather than yourself; and (3) Propose a plan that would help college students rise up to meet the challenges they encounter in college by fostering a growth mindset.

ePortfolios. We introduced the program cohort to the Mahara ePortfolio system during the second day of the summer program. We suggested that ePortfolios could become students’ scholarly social media pages. At the initial ePortfolio workshop students created ePortfolio pages, wrote journal entries describing their first few days in the program, and uploaded an image. Although students completed ePortfolios during both 2015 and 2016, only students from the 2016 cohort expected to include their assignments in their ePortfolios. In 2015, the initial ePortfolio workshop took place prior to the completion of the growth mindset worksheet.

Coding. The total number of words written in response to each of the three prompts was recorded. Review of initial student responses to the assignment revealed that students provided primarily conceptual responses to prompt 1 (concepts prompt), reflective responses to prompt 2 (reflection prompt), and future planning responses to prompt 3 (planning prompt). We also conducted binary qualitative coding of each assignment. Assignments were classified as including full conceptual content when students correctly and completely summarized the presented research on mindsets. Responses to the reflection prompt were classified as showing growth or fixed mindset. Students who reported that their current view of intelligence was growth were classified as having a growth mindset. Students who reported that they desired to have a growth mindset were not classified as having a growth mindset. Students who reported having a growth mindset about non-academic skills but a fixed mindset about academic skills were also not classified as having a growth mindset. We also classified whether responses were indicative of a shifting mindset. This classification was independent of the overall mindset classification. If students reported that their mindsets changed over time, they were coded as having a shifting mindset. Students who described an incomplete shift were classified as having both their initial mindset and a shifting mindset. Finally, students were classified as demonstrating grit if they described determination and substantial efforts that allowed them to overcome a difficult setback.

Results

The average number of words produced in response to the three prompts are reported as a function of assignment type in Table 1. To assess the extent to which assignment format influenced content, we calculated a mixed 2 (Format: worksheet, ePortfolio) x 3 (Content: concepts, reflection, planning) ANOVA on the number of words produced. Format varied between subjects and Content varied within subjects. We observed a main effect of Format with a large effect size, $F(1, 36) = 18.54, p < .001$, partial eta squared = .34, with more words produced in ePortfolios ($M = 314$)

Table 2
Percentage of Students Who Provided Complete Answers, Described a Growth Mindset, Described a Shifting Mindset, and Described Grit are Reported as a Function of Assignment Format

Measure	Worksheet	ePortfolio	χ^2
Complete answer	52.9	90.5	6.83**
Growth mindset	58.8	61.9	0.037
Shifting mindset	17.6	52.4	4.87*
Grit	11.8	57.1	8.31**

Note. * $p < .05$. ** $p < .01$.

than worksheets ($M = 139$). We also observed a main effect of Content with a large effect size (Wilks' Lambda = .53, $F(2, 72) = 15.36$, $p < .001$, partial eta squared = .30). Pairwise comparisons with a Bonferroni correction revealed that students produced more words in response to the reflection prompt ($M = 111$) than the concepts ($M = 66.74$) or planning ($M = 58$), $p < .001$. We did not observe an interaction between Format and Content, $F(2, 72) = .56$.

The percentage of students who provided complete answers, described a growth mindset, described a shifting mindset, and described a time when they displayed grit are reported as a function of assignment format in Table 2. To determine whether the frequency of these features of students' responses varied by assignment format we calculated four chi-square tests of independence. No effect of assignment format was present for the likelihood of reporting a growth mindset, $\chi^2(1) = 0.04$. However, students completing ePortfolios were significantly more likely than students who completed worksheets to produce Complete Answers (90.5% vs. 52.95%), $\chi^2(1) = 6.83$, $p < .01$, report a Shifting Mindset (52.4% vs. 17.6%), $\chi^2(1) = 4.87$, $p < .05$, and describe a time in their lives when they displayed Grit (57.1% vs. 11.8%), $\chi^2(1) = 8.31$, $p < .01$. In every instance of a shifting mindset, the direction of change described was from a fixed mindset towards a growth mindset.

Discussion

Given students' preference for typing over writing, we hypothesized that typed assignments would evoke more content than handwritten assignments. We found support for this hypothesis. Students produced more than double the content in ePortfolios than in handwritten worksheets. Increased content was seen in response to concepts, reflection, and planning prompts. Students who completed ePortfolio assignments were also more likely than students who completed worksheets to demonstrate conceptual mastery by summarizing the talk accurately and completely. Although intriguing, the observed differences must be considered in the context of the ungraded nature of the

assignments. We assume that students would be more likely to provide complete responses to graded than ungraded worksheets. However, because brief psychological interventions are frequently presented in ungraded contexts, it is important to consider using a typed response format whenever possible. It is also not possible to determine whether students produced more content because the ePortfolio assignment was typed or because it was being included in an ePortfolio. We explored this question in Study 2.

Given the theorized mechanism of change in brief psychological interventions, we hypothesized that mindset assignments would evoke reflection. We found support for this hypothesis. In both assignment formats students produced more content in response to the reflection prompt than the concepts or planning prompts. This finding supports the possibility that brief psychological interventions influence students by causing them to reconsider their interpretations of past experiences.

Finally, given previous research on ePortfolios, we hypothesized that ePortfolio assignments would evoke more reflection than worksheets. Although students produced more content in ePortfolio assignments than worksheets and produced more reflective content than concepts or planning content in both assignment formats, we did not observe proportionately more reflective content in ePortfolios than in worksheets. We also failed to observe a difference in the proportion of students who reported that they currently had a growth mindset. However, our qualitative coding did reveal evidence supporting this hypothesis.

Students who completed ePortfolio assignments were more likely than students who completed worksheets to describe a time when they displayed grit. We also found that students who completed ePortfolio assignments were more likely than students who completed worksheets to describe a shifting mindset. The description of a shifting mindset required a detailed response. This may explain why a shifting mindset was seen less frequently in the worksheets. Nonetheless, we believe that the increased proportion of shifting mindset and grit descriptions present in the ePortfolio assignments is evidence that students responded to these assignments with higher levels of reflection. We

believe that increased references to grit in ePortfolio assignments may reflect deeper processing of the material because increased grit has been hypothesized to be associated with a growth mindset (Boaler, 2013).

As noted above, in the current study assignment format (i.e., worksheet or ePortfolio) was confounded with response mechanism (i.e., handwritten or typed). Also, because the assignments were not graded, it is difficult to determine whether the observed response patterns can be generalized to graded work. Finally, all students who participated in Study 1 would be classified as coming from at-risk groups. Thus, it is difficult to know whether these results would apply to the broader population of college students. To determine whether similar effects would be seen in response to graded assignments and alternate delivery formats, in Study 2 undergraduate students from a four-year school completed the mindset intervention as part of an academic class, in either a graded ePortfolio or a graded typed paper.

Study 2

In Study 2, we were interested in determining whether students who completed a mindset intervention as part of a graded ePortfolio would produce more content and deeper reflection than students who completed an identical intervention as a graded paper. This study was designed to replicate and expand on the work that was reported in Study 1. In Study 2, we assessed students' mindset before and after the intervention in order to investigate whether participation in the intervention would result in a shift toward a growth mindset. We compared responses to a mindset intervention by students who enrolled in the class Child Development during the fall semester in the years 2015 and 2016.

Method

The class. Child Development is offered at the four-year institution that hosts the summer program described in Study 1. It is a lower-level class that fulfills the college general education requirement for social sciences. Students complete reflective autobiographical writing that has a conceptual focus in nine assignments. All assignments are graded with rubrics, and students receive written feedback from the professor and from an undergraduate teaching assistant. Each assignment contributes 6% to students' final grade in the course. The course enrolls 60 students each semester. An expanded version of the mindset intervention described in Study 1 was included as the eighth assignment during the thirteenth week of the semester.

Participants. This study used a convenience sample. In 2015, 56 students (51 females, 4 males, 1

other) completed the mindset assignment in an ePortfolio. In 2016, 54 students (38 females, 16 males) completed the mindset assignment as a typed paper that was submitted through the Turnitin program. None of the students in Study 2 were participants in Study 1. The ePortfolio sample included 65% first-year students, 50% students who identified themselves as members of a URM group (13 who identified as African American, 12 Latino, 2 mixed) and 50% who did not identify themselves as members of a URM group (26 Caucasian, 1 Asian). The average age of students in this sample was 18.78 ($SD = 1.25$). The typed paper sample included 54% first-year students, 52% students who identified themselves as members of a URM group (21 Latino, 5 African American, 1 Native American, 2 other), and 48% who did not identify themselves as members of a URM group (25 Caucasians, 2 Asian). The average age of students in this sample was 18.79 ($SD = 1.79$).

Procedure and materials

Theory of intelligence assessment. Students completed the Theory of Intelligence Scale (Dweck, 1999) during the first and final weeks of the semester as part of a larger online survey. The scale includes statements that describe fixed views of intelligence and statements that describe growth views of intelligence. Students reported the extent to which they agreed with each statement using a 6-point Likert-type scale that ranged from 1 (*disagree strongly*) to 6 (*agree strongly*). Statements describing fixed views of intelligence were reverse coded so that higher scores reflected more of a growth view of intelligence.

Mindset assignment. In addition to the three prompts included in the Study 1 mindset assignment, students responded to three additional prompts that related the material to child development: (1) Explain how different types of praise influence children's responses to challenging tasks; (2) Look forward and describe two ways that you can help children to achieve a growth mindset; and (3) List the top three things you would like to remember about mindsets to be a better influence on the children in your life. To maintain consistency in the responses assessed in Studies 1 and 2, responses to these prompts were not analyzed in the current study.

Assignment formats. During the first week of the semester, students were introduced to the LiveText ePortfolio system in 2015 and to the Turnitin system in 2016. The instructor introduced both assignment formats using the same language. She suggested that the assignments would document students' learning and provide a permanent way to reflect on their experiences in childhood and their wishes for their future children. Students were encouraged to add images to their assignments and to share their assignments with friends and family. Prior to completing the work, students were

Table 3

Number of Words Produced in Response to Concepts, Reflection, and Planning Prompts in ePortfolios and Papers

Measure	Paper <i>M (SD)</i>	ePortfolio <i>M (SD)</i>	<i>M</i>
Concepts	128.77 (75.70)	93.61 (49.45)	111.51
Reflection	172.00 (84.14)	162.24 (100.11)	167.21
Planning	92.77 (55.27)	102.59 (85.91)	97.59
Total words	393.54	358.44	

provided with a grading rubric for the assignment and encouraged to check their assignments against the rubric before turning them in.

Coding. We used the same coding from Study 1 in Study 2.

Results

Students responded positively to both ePortfolio and paper assignments. In response to a survey completed during the final week of classes, more than 75% of students reported that the assignments (whether completed in ePortfolios or papers) enhanced learning, allowed an accurate assessment of learning, encouraged reflection, provided a permanent record of learning, and should be used in future classes. One student commented on the value of personal reflections as encouragement for authentic learning, saying, “I think the ePortfolios are a great way to get a student invested in the subject for more than just a grade.” Another responded to a question asking about the most important things learned in the class in this way: “Connecting concepts that we learned with my own childhood . . . getting that ‘aha’ moment.”

We initially calculated all analyses with URM status included as a between-subject variable. However, no effects of URM status were observed. Accordingly, we report analyses with URM status collapsed. The number of words produced in response to the concepts, reflection, and planning prompts are reported as a function of assignment type in Table 3. To assess the extent to which format influenced content, we calculated a mixed 2 (Format: paper, ePortfolio) x 3 (Content: concepts, reflection, planning) ANOVA on the number of words produced. Format varied between subjects, and Content varied within subjects. We did not observe a main effect of Format, $F(1, 108) = 0.89$. We did observe a main effect of Content, with a large effect size (Wilks’ Lambda = .45, $F(2, 216) = 58.32$, $p < .001$, partial eta squared = .35). Pairwise comparisons with a Bonferroni correction revealed that students produced more words in response to the reflection prompt ($M = 167.21$) than the concepts ($M = 111.51$) or planning ($M = 97.59$) prompts, $p < .001$.

However, this main effect was qualified by an interaction between Format and Content, with a small

effect size (Wilks’ Lambda = .90, $F(2, 216) = 5.47$, $p < .01$, partial eta squared = .05). We explored the interaction using Tukey’s HSD post hoc test (critical value = 16.83, $p < .05$). This revealed that the reflection and planning prompts evoked similar numbers of words in both formats. However, students completing papers produced more words in response to the concepts prompt ($M = 128.77$) than students completing ePortfolios ($M = 93.61$). Students completing ePortfolios produced equivalent content in response to the concepts ($M = 93.61$) and planning prompts ($M = 102.59$). However, students completing papers produced significantly more content in response to the concepts ($M = 128.77$) than the planning prompts ($M = 92.77$).

The percentage of students who provided complete answers, described a growth mindset, described a shifting mindset, and described a time when they displayed grit are reported as a function of format in Table 4. To determine whether the frequency of these qualitative features of students’ responses varied by format, we calculated four chi-square tests of independence. We found that regardless of format, students were equally likely to provide complete answers, $\chi^2(1) = 0.46$, or describe a shifting mindset, $\chi^2(1) = 0.32$. However, students completing ePortfolios were significantly more likely than students completing papers to report a growth mindset (64.8% vs. 42.9%), $\chi^2(1) = 5.33$, $p < .05$, or describe a time when they displayed grit (44.4% vs. 19.6%), $\chi^2(1) = 7.80$, $p < .01$.

Pre-test and post-test theory of intelligence scores are reported as a function of assignment format in Table 5. To determine whether format influenced students’ responses to the Theory of Intelligence Scale we calculated a mixed 2 (Format: paper, ePortfolio) x 2 (Theory measure: pre-test, post-test) ANOVA on theory of intelligence scores. Format varied between subjects and theory measure varied within subjects. We observed a main effect for theory measure, with a small effect size (Wilks’ Lambda = .94, $F(1, 88) = 5.56$, $p < .05$, partial eta squared = .06). Students reported stronger endorsement of a growth mindset after completing the intervention ($M = 4.66$) than before completing the intervention ($M = 4.40$). We did not observe a main effect for format, $F(1, 88) = 0.05$, or an interaction between Theory measure and format, $F(1, 88) = 0.98$.

Table 4
Percentage of Students Who Provided Complete Answers, Described a Growth Mindset, Described a Shifting Mindset, and Described Grit are Reported as a Function of Assignment Format

Measure	Paper	ePortfolio	χ^2
Complete answer	91.1	94.4	0.46
Growth mindset	42.9	64.8	5.33*
Shifting mindset	44.6	50.0	0.32
Grit	19.6	44.4	7.80**

Note. * $p < .05$. ** $p < .01$.

Table 5
Pre- and Post-Test Theory of Intelligence Scores are Reported as a Function of Assignment Format

Time	Paper <i>M (SD)</i>	ePortfolio <i>M (SD)</i>	<i>M</i>
Pre-test	4.47 (0.79)	4.31 (1.42)	4.40
Post-test	4.63 (0.92)	4.70 (1.30)	4.66
Mean	4.55	4.51	

Note. Scores ranged from 1 to 6 with higher scores indicating stronger endorsement of growth theories of intelligence.

Discussion and Conclusions

In Study 2, we determined whether students who completed a mindset assignment as part of a graded ePortfolio would produce more content and deeper reflection than students who completed an identical assignment as a graded paper. As expected, we replicated our finding from Study 1 that responses to a growth mindset intervention evoked more reflection than concepts regardless of assignment format. This supports the idea that mindset interventions work by inducing reflection and that these reflections might be the mechanism that changes how students interpret pivotal events.

In Study 2, students who completed the assignments as graded papers produced more conceptual content (as measured by word count) than students who completed the assignments as graded ePortfolios. Interestingly, students were equally likely to produce complete conceptual information regardless of assignment format. Thus, it appears that students in both groups fully explained the evidence supporting the value of a growth mindset; however, the students who created ePortfolio assignments presented the information more concisely than the students who prepared more traditional academic papers. Students produced similar amounts of content in response to the reflection and future planning prompts regardless of assignment format. Taken together, these results may support the idea that ePortfolio practice encourages students to focus more on reflection and planning than on reporting. It also appears likely that a typed response

format encourages more detailed responses than handwritten worksheets. It should be noted that amounts of content were similar in the ungraded ePortfolio assignments created in Study 1 and the graded ePortfolio assignments created in Study 2. Thus, it appears that typing is more likely than grading to encourage increased effort.

It is not surprising that in the rubric-graded assignments used in Study 2, the vast majority of students provided all required information. However, students who were writing for an ePortfolio may have invested less energy into expanding the conceptual part of the assignment if they viewed the other parts of the assignment as more central or interesting. The public nature of ePortfolios may encourage reflection and discourage detailed reporting. Conversely, students who viewed the assignment as an academic paper may have written more words in response to the concepts prompt to make the assignment seem more like a traditional academic paper. This interpretation is supported by feedback that the instructor received from the group who completed the assignment as a typed paper. Several students in this group reported that they did not like the mindset assignment because they felt that the TEDx Talk (Briceño, 2012) lacked sufficient detail to support a full paper. One student found a transcript of the talk to be sure to include all relevant details. Another student suggested that in future years, a journal article should be assigned along with the TEDx Talk. No student raised concerns about the limited available information when the assignment was presented in an ePortfolio format.

We replicated our finding from Study 1 that students who created ePortfolios were more likely to describe a time when they displayed personal grit than students who completed the assignment in another format. Because increased grit has been hypothesized to be an outcome associated with a growth mindset (Boaler, 2013), we believe that increased references to grit may reflect deeper processing. Study 2 failed to replicate the finding that a higher proportion of students reported a shifting mindset in ePortfolios than in another format. It appears that the difference observed in Study 1 may have been driven by the fact that a very small proportion of students who completed worksheets described a shifting mindset (11.8%). Because the description of a shifting mindset requires a detailed response, it seems likely that students who completed worksheets did not write enough to describe a shift.

In Study 2, we found that students who completed ePortfolio assignments were more likely than students who completed papers to describe a growth mindset (a difference that was not observed in Study 1). Interestingly, the proportion of students who described themselves as having a growth mindset was similar among the students who completed ePortfolio assignments in Study 1 (61.9%) and Study 2 (64.8%). However, the proportion of students who reported a growth mindset in typed papers was substantially lower (42.9%). Perhaps students who were preparing papers viewed the mindset assignment as primarily an academic task and were therefore less likely to endorse the perspective that was recommended in the TEDx Talk. In contrast, students writing for ePortfolios may have viewed the assignment as an opportunity for personal growth and therefore were more likely to adopt a growth view of intelligence. Despite the observed differences in students' descriptions of their mindsets, we observed increases in endorsements of statements reflecting a growth mindset, regardless of assignment format. Thus, it appears that all students were positively influenced by the completion of the mindset assignment.

There were some limitations to the current work. Because we relied on convenience samples, there may have been uncontrolled differences between the comparison groups. In future work, random assignment to condition would allow a stronger test of the hypotheses explored in the current work. Additionally, we hypothesize that the delivery of the mindset intervention will be strengthened by the use of ePortfolios. However, the expected outcomes of increased persistence, retention, and academic success are not possible to assess at present. In future work we will examine the full effects of the intervention on these outcome variables.

In conclusion, the results of these two studies support the claim that ePortfolio practice encourages

the application of concepts to the self (Eynon et al., 2014; Nguyen, 2013; Singer-Freeman et al., 2014, 2016). ePortfolios evoked proportionately more reflection than concepts or planning. These positive effects of ePortfolio delivery were present for both URM and non-URM students. ePortfolios appear to be a promising format for the delivery of brief psychological interventions and other assignments that rely on reflection.

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