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The Relationship Between Electronic Portfolio Participation and Student Success

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Abstract

Electronic portfolios (e-portfolios) represent an assessment measure with strong potential to provide feedback about student performance to improve curricula and pedagogy, to determine individual students' mastery of learning and support feedback for improvement, and to actively involve students in the assessment process. This study examined the relationship between e-portfolio participation and student success. Despite some limitations, the current study demonstrates that, after controlling for background factors, undergraduate students with e-portfolio artifacts had significantly higher grade-point averages, credit hours earned, and retention rates than a matched set of students without e-portfolio artifacts. Also, there were significant positive relationships between various measures of e-portfolio utilization and grade-point average and credit hours earned. There were no statistically significant group differences in any of the National Survey of Student Engagement or New Student Transition Questionnaire scales, which served as measures of student academic engagement.

Background

Many criticize the state of contemporary American higher education. Some fear that students are not developing competencies such as communication, critical thinking, and a developed sense of social responsibility. There is increasing skepticism concerning the quality and utility of a liberal arts education. Members of the public, employers, and legislators are concerned with the perceived lack of attention that faculty give to undergraduate learning (American Council on Education [ACE], American Association of Community Colleges [AACC], American Association of State Colleges and Universities [AASCU], Association of American Universities, [AAU], National Association of Independent Colleges and Universities [NAICU], & National Association of State Universities and Land Grant Colleges [NASULGC], 2006;

U. S. Department of Education, 2006). Colleges and universities must respond to these criticisms at the same time students are arriving on campus with an increasingly diverse array of experiences, preparation, and expectations.

Several recent longitudinal studies across a wide variety of institutions have highlighted problems affecting the state of undergraduate learning in the United States. Problems include a discontinuity between K-12 schools and colleges, institutional confusion over purposes and goals, and the tension between the liberal arts and professional curricula. Other concerns relate to the conflict many faculty members experience between loyalty to their institutions and to their disciplines and between their interest in teaching and their priorities in research. The divisions between academic and student affairs on campuses create additional challenges. The studies highlight the need to draw more explicit connections between the classes students take and their in- and out-of-class experiences; to become more student-centered; to promote student-faculty and student-student interaction; and to encourage collaborative, active learning activities. These studies also suggest the need to improve student engagement, make high expectations explicit, and emphasize competency over content and collaboration over competition (Astin, 1993; Boyer, 1987; Gamson & Chickering, 1987; Joint Task Force, 1998; Kellogg Commission, 1997; Kuh, Schuh, Whitt, & Associates, 1991; National Institute of Education, 1984; Pascarella & Terenzini, 1991; Schneider & Schoenberg, 1998).Assessment has been suggested by many as a means of addressing these problems. The "assessment movement" that began in the mid-1980s has been traced to both an extant scholarship of student learning and success (e.g., Astin, 1977; Bowen, 1977; Feldman & Newcomb, 1969; Learned & Wood, 1938; Pace, 1979; Tinto, 1975) and especially to a series of calls from outside the academy to improve accountability (e.g., National Governors' Association, 1986; National Commission on Excellence in Education, 1983). While 98% of institutions reported having an assessment program by 1993 (El-Khawas, 1993), many scholars and practitioners have noted that assessment has not substantially improved student learning at most institutions. Ewell (2002) notes this lack of success may be the result of disagreement about the underlying purpose of assessment. Is it to benchmark institutional performance in the name of accountability as in K-12 education? Is it intended to provide feedback about student performance to improve curricula and pedagogy? Is its goal to determine an individual student's mastery of learning and to provide feedback for improvement? Ewell (2002) suggests that for assessment to move from its current state of "broad but not deep," fundamental changes must occur. The assessment paradigm must shift from "a largely top-down, management-oriented" evaluation and passive checking of results to one of "active and collective responsibility for fostering student attainment" that resides at the level of the individual faculty member and academic program (p. 24).

Student portfolios became an increasingly popular assessment method in the 1990s (Ewell, 2002). Banta (1999) has termed them "the instrument of choice for assessment on a growing number of campuses" (p. 3). Love, McKean, and Gathercoal (2004, p. 24) say that they "may have the most significant effect on education since the introduction of formal schooling." Portfolios hold a high degree of promise for accomplishing the last two purposes of assessment noted by Ewell (2002): providing feedback about student performance to improve curricula and pedagogy as well as determining individual students' mastery of learning and providing feedback for improvement. Additionally, they provide students with a planning and goal-setting tool that assists them in making connections between learning experiences, provide faculty with a vehicle for more authentic discussions about teaching and learning, and provide institutions with a tool to establish a more permanent role in the lives of learners (Siemens, 2004). Also, portfolios achieve a goal that many other assessment methods can not. They change the student role in assessment from passive research subject to active participant as students are called upon to select samples of their classroom and co-curricular work products or artifacts for the portfolio and (perhaps most importantly) to reflect upon why these artifacts were selected and how they demonstrate learning (Palomba, 2002). Portfolios are not without their challenges as

an assessment method. To be used successfully, they require a great deal of faculty and student time and require clear guidelines related to purpose, how content is evaluated, and how feedback is provided.

In addition to the features associated with paper and pencil portfolios, electronic (web-based) portfolios (e-portfolios) offer the advantages of accessibility and portability of artifacts, faculty/advisor assessments, and student reflections. Also, artifact formats such as video and sound recordings that are difficult to include in traditional portfolios are easily included in e-portfolios. Finally, many e-portfolio software packages allow students to control who is able to view each artifact. They allow reflection and assessment, and they permit both developmental/assessment and showcase (for prospective employers, graduate/professional schools, etc.) formats to be presented (Cambridge, 2001; Yancey, 2001).

Institutional Context

Bowling Green State University (BGSU), a state-assisted, residential, doctoral-research-intensive university in northwest Ohio, has grappled with many of the assessment challenges noted above. While most academic programs have developed learning outcomes, created or acquired associated measures, and collected data—and some examples of improvements to curricula and pedagogy are evident—assessment has not led to profound changes in student learning or to a widespread "culture of evidence." Many faculty and nearly all students are not aware of assessment efforts and a bureaucratic compliance mentality still permeates many annual assessment reports. At the same time, the University has articulated as its vision a desire to be "the premier learning community in Ohio and one of the best in the Nation." It has developed a wide slate of learning communities and other student academic enrichment programs, identified a set of University learning outcomes, redesigned its general education program, substantially upgraded its technology infrastructure, and improved its institutional research capacity.

BGSU acquired the Epsilen electronic portfolio software in 2003. As noted above, students can place a variety of artifacts (e.g., papers, spreadsheets, presentations, video and audio recordings) and accompanying reflections into both a year-by-year matrix that shows students' progress over time for assessment purposes and also into a "showcase" version of the e-portfolio that might be viewed, for example, by potential employers or graduate/professional schools. The software's reporting capability allows the following elements to be counted for each participant: showcase artifacts (artifacts in the showcase version of the student's e-portfolio), matrix artifacts (artifacts in the matrix version of the student's e-portfolio), artifact-specific reflections, general reflections, total files uploaded to the e-portfolio, events posted to the student's e-portfolio calendar, bookmarks created in the e-portfolio, number of number of resumes were uploaded to the e-portfolio, and number of times resumes were viewed (by anyone). Additional information about the BGSU e-portfolios can be found at http://epsilen.with.bgsu.edu

The first use of e-portfolios by students occurred in the 2003–2004 academic year, as they were adopted on a voluntary basis by many of the first-year student programs. Usage was further increased in 2004 when the University joined the National Coalition for Electronic Portfolio Research. This organization, initially sponsored by the American Association for Higher Education, is designed to facilitate research on the effects of e-portfolio participation on student learning and success. Further details about the Coalition can be found at http://ncepr.org/ncepr/drupal/about

Now in the fourth year of implementation, the number of e-portfolio accounts has grown substantially. Early growth came through adoption by a few instructors and word-of-mouth endorsements among students (e.g., "my e-portfolio got me an internship!"), along with improved stability of the software. A major milestone was the inclusion of the e-portfolio software inside the University's portal, enabling a single login and navigation among all authorized web applications. Coincidentally, this user-friendly approach is responsible for the accounts in which no artifacts have been uploaded—a single click on an e-portfolio link inside the portal will create an account, even when the student had no intention to do so. A comparison of Epsilen with two other commercial e-portfolio systems in three sections of

a sophomore-level Education course revealed a preference for Epsilen due to its ease of use. Epsilen e-portfolios are introduced by instructors in some first-year experience classes, sections of general studies writing, and courses in the general education program, but usage throughout the University remains voluntary.

Pilot Study

A pilot study (Knight, Hakel, & Gromko, 2004) was carried out that compared retention rates, grade-point averages, and credit hours earned between the population of 41 BGSU undergraduates who had e-portfolio artifacts and a matching sample of 41 students who did not have e-portfolios. The comparison was made in this way because many students with e-portfolio accounts were found to have uploaded no artifacts. Students with e-portfolio artifacts had both significantly greater cumulative grade-point averages and credit hours earned than undergraduates without e-portfolio artifacts. There was no significant difference in retention rates between undergraduate students with and without e-portfolio artifacts. After demographic and educational background factors were controlled, no significant differences were found concerning retention or grade-point average, although significantly greater credit hours earned remained for students with e-portfolio artifacts. Finally, the number of e-portfolio artifacts was not significantly related to retention, grade-point average, or credit hours earned.

Research Questions

This paper describes of a second research study with a much larger number of participants, which was designed to investigate the following research questions:

1. What are the characteristics of students who have e-portfolio artifacts and how are such students different than others at BGSU?
2. What significant differences exist in retention rates, grade-point averages, and credit hours earned for BGSU students who have e-portfolio artifacts, those who have e-portfolio accounts but no artifacts, and a control group of students who did not create e-portfolios?
3. What significant differences exist in students' self-reported academic engagement for BGSU students who have e-portfolio artifacts, those who have e-portfolio accounts but no artifacts, and a control group of students who did not create e-portfolios?
4. Are there significant relationships between various artifact measures (number of showcase artifacts, number of matrix artifacts, number of artifact-specific reflections, number of general reflections, total number of files uploaded to the e-portfolio, number of events posted to the student's e-portfolio calendar, number of bookmarks created in the e-portfolio, number of number of resumes uploaded to the e-portfolio, and number of times the resumes were viewed) and retention rates, cumulative grade-point averages, and cumulative credit hours earned for students who have e-portfolio artifacts?
5. Does having e-portfolio artifacts significantly predict retention, grade-point average, and credit hours earned after student background factors (gender, race, age, high school grade-point average, living arrangements, and college) are controlled?

Method

Data from all 2004–2005 undergraduate e-portfolio accounts were extracted from the e-portfolio database in July 2005. Students included both those at BGSU's main campus and at Firelands, its associate-degree-granting regional college located in Huron, Ohio. While 1,333 accounts existed, an inspection of the contents of each account revealed that 821 accounts actually contained one or more artifacts. The number of showcase artifacts (artifacts in the showcase version of the student's e-portfolio), matrix artifacts (artifacts in the matrix version of the student's e-portfolio), artifact-specific reflections, general reflections, total files uploaded to the e-portfolio, events posted to the student's e-portfolio calendar, bookmarks created in the e-portfolio, number of number of resumes uploaded to the e-portfolio, and number of times the resumes were viewed were recorded for each e-portfolio. Demographic and educational outcome data were collected for (a) the students with e-portfolio artifacts (n = 821), (b) the students who had created e-portfolio accounts but had no artifacts in their e-portfolios (n = 512), and (c) a

random sample of 821 students who had no e-portfolio accounts (control group). Demographic data consisted of sex, race, age, college, class rank, academic status (good standing, Dean's List, probation, suspension), living arrangements (on- or off-campus), high school grade-point average, and ACT composite score. Educational outcome data included retention from the Spring 2004 to Fall 2005 semesters, cumulative grade-point average, and student credit hours earned as of the conclusion of the Spring 2005 semester.

Undergraduate students with e-portfolios were similar to all BGSU undergraduate students except for their distribution by college, class rank, and gender. Therefore undergraduate students in the control group were proportionately matched by college, class rank, and gender to undergraduate students in the e-portfolio groups. Scale scores from the Fall 2004 administration of the BGSU New Student Transition Questionnaire (NSTQ), one indicator of student academic engagement) administered to new freshmen, were also included in the database. NSTQ scores were available for 239 (35%) of the freshmen in the-e-portfolio groups and 151 (35%) of the control group freshmen. Data from the National Survey of Student Engagement (NSSE) were available for 106 (16%) of the freshmen in the e-portfolio groups and 46 (11%) of the control group freshmen. Descriptive, univariate, and multivariate statistical analyses were used to address the remaining research questions.

Results

Table 1 describes and compares the population of BGSU students with e-portfolio artifacts, with e-portfolio accounts but without artifacts, and the control group without e-portfolio accounts. Students with e-portfolio artifacts were significantly more likely to be female ($\chi^2 = 15.7$, $df = 2$, $p < .001$), students of color ($\chi^2 = 44.9$, $df = 14$, $p < .001$), in the College of Musical Arts ($\chi^2 = 73.3$, $df = 16$, $p < .001$), on the Dean's List ($\chi^2 = 167.5$, $df = 15$, $p < .001$), and live on campus ($\chi^2 = 128.5$, $df = 2$, $p < .001$). Those with e-portfolio artifacts were also likely to have higher ACT scores ($F = 4.2$, $df = 2,1840$, $p < .05$), higher high school grade-point averages ($F = 19.2$, $df = 2,1889$, $p < .001$), higher cumulative college grade-point averages ($F = 21.7$, $df = 2,1986$, $p < .001$), and higher credit hours earned ($F = 21.7$, $df = 2,1986$, $p < .001$). Those in the control group were significantly likely to be older students ($F = 94.7$, $df = 2,2151$, $p< .001$).

Retention rates to Fall 2005 were significantly different between groups. Those with e-portfolio artifacts had higher retention rates than those with e-portfolio accounts but no artifacts, who, in turn, had higher retention rates that those in the control group (see Table 2). Please note that the sum of students retained and not retained does not equal the total number of students by group because 236 of the students graduated in May or August 2005.

As noted in Table 3, undergraduates who had e-portfolio artifacts showed significantly higher grade-point averages than either those with e-portfolio accounts but no artifacts or the control group. Also, students with e-portfolio artifacts had significantly greater credit hours earned as compared with the control group. Finally, undergraduates with e-portfolio accounts but with no artifacts had significantly greater credit hours earned than students in the control group.

Tables 4 and 5 indicate that there were no statistically significant group differences in any of the NSTQ or NSSE scales, which serve as measures of student academic engagement. See Kuh (2001) for details about the NSSE items and scales and see http://www.bgsu.edu/offices/ir/studies/transition/newstudent06.htm for a listing of the NSSE items.

Since the majority of undergraduate students with some e-portfolio artifacts were missing showcase artifacts, artifact-specific and general reflections, and events posted to calendars, bookmarks, and resumes, only the number of matrix artifacts and total number of files uploaded were related to retention rates through logistic regression analysis. As shown in Table 6, neither of these relationships was statistically significant. It is likely that many students are missing several of the e-portfolio elements because their use remains voluntary and few classes beyond those in the first year include assignments where students are asked to use e-portfolios.

Table 7 highlights significant positive correlations between grade-point average and number of showcase artifacts, total number of files uploaded, and number of resumes uploaded, and between credit hours

Table 1

Descriptive Statistics for 2004–2005 BGSU Students by Group

Characteristic	Group: With e-portfolio Artifacts N	With e-portfolio Artifacts %	Without e-portfolio Artifacts		Control Group	
Race/Ethnicity						
American Indian	2	0.2%	5	1.0%	3	0.4%
Asian	2	0.2%	3	0.6%	7	0.6%
Black	85	10.4%	46	9.0%	44	5.4%
Hispanic-Latino	14	1.7%	13	2.5%	34	3.0%
Hispanic-Other	0	0.0%	0	0.0%	4	0.0%
White	689	83.9%	434	84.8%	708	86.2%
Other	5	0.6%	4	0.8%	1	0.1%
Unknown	24	2.9%	7	1.4%	20	2.4%
Sex						
Female	594	72.4%	319	62.3%	577	70.3%
Male	227	27.6%	227	37.7%	244	29.7%
College						
Arts and Sciences	169	20.6%	130	25.4%	169	20.6%
Business Administration	96	11.7%	45	8.8%	97	11.8%
Education and Human Development	297	36.2%	144	28.1%	299	36.4%
Firelands	6	0.7%	0	0.0%	6	0.7%
Health and Human Services	59	7.2%	53	10.4%	61	7.4%
Musical Arts	61	7.4%	5	1.0%	56	6.8%
Technology	27	3.3%	26	5.1%	27	3.3%
Undeclared	101	12.3%	107	20.9%	101	12.3%
Non-Degree	5	0.6%	2	0.4%	5	. 0.6%
Class Rank						
Freshman	429	52.3%	255	49.8%	426	51.9%
Sophomore	189	23.0%	111	21.7%	189	23.0%
Junior	101	12.3%	71	13.9%	108	13.0%
Senior	97	11.8%	73	14.3%	93	11.3%
Non-Degree	5	0.6%	2	0.4%	5	0.6%
Academic Status						
Dean's List	256	31.2%	125	24.4%	123	15.0%
Good Standing	508	61.9%	322	62.9%	506	61.6%
Warning	36	4.4%	31	6.1%	77	9.4%
Probation	4	0.5%	15	2.9%	60	7.3%
Suspension	12	1.5%	15	2.7%	52	6.3%
Not Applicable	5	0.6%	4	0.8%	1	0.1%
Living Arrangements						
On-Campus	544	66.3%	337	65.8%	338	41.2%
Off-Campus	277	33.7%	175	34.25	483	58.8%

earned and total number of files uploaded and number of resumes uploaded. It may be that students with a greater number of credit hours are closer to graduation and are posting resumes to their e-portfolios as they seek employment.

Table 8 shows that undergraduates with e-portfolios were better retained after sex, race, age, high school grade-point average, college, and living arrangements were controlled. Having e-portfolio artifacts had significantly positive effects upon grade-point average (see Table 9) and credit hours earned

Table 1 (continued)

Descriptive Statistics for 2004–2005 BGSU Students by Group

Characteristic	Group: With e-portfolio Artifacts M	SD	Without e-portfolio Artifacts M	SD	Control Group M	SD
High School Grade-Point Average	3.31	0.51	3.18	0.52	3.14	0.55
ACT Score	21.95	4.05	21.30	3.61	21.79	3.76
Age	20.08	2.57	20.03	2.49	22.91	6.83
Number of Times the Resume Page Was Viewed	6.46	12.07				
Number of Bookmarks	2.27	1.84				
Number of Events Posted to Calendar	5.37	11.37				
Number of Files Uploaded	5.16	7.36				
Number of Showcase Artifacts	2.73	2.48				
Number of Matrix Artifacts	4.47	6.49				
Number of Reflections Associated with Documents	4.84	3.59				
Number of General Reflections	4.51	3.72				
Number of Resumes Uploaded	1.01	0.12				
Cumulative Grade-Point Average	3.03	0.68	2.85	0.79	2.79	0.80
Cumulative Credit Hours Earned	62.95	37.95	61.87	40.44	55.65	40.38
NSTQ Social Adjustment Scale	29.18	4.55	29.12	4.55	29.40	4.56
NSTQ Academic Adjustment Scale	10.29	3.18	10.43	3.26	9.70	2.93
NSTQ Satisfaction with Living Arrangements Scale	11.13	2.50	11.67	2.40	11.23	2.59
NSTQ University Involvement Scale	8.88	2.60	9.34	1.96	9.30	2.27
NSTQ Other Involvement Scale	7.95	1.38	7.93	1.40	7.62	1.50
NSSE Academic Challenge	53.98	14.27	60.29	12.53	55.29	11.50
NSSE Active and Collaborative Learning	45.89	16.52	49.02	15.99	46.48	17.06
NSSE Student-Faculty Interaction	42.92	18.68	51.31	18.82	48.00	21.93
NSSE Enriching Educational Experiences	30.02	13.78	31.90	15.42	31.20	12.79
NSSE Supportive Campus Environment	60.67	16.74	69.26	13.70	62.69	14.28

Table 2

Difference in Retention Rates to Fall 2005 by Group

	Retained	Not Retained	χ^2 (1)
Students with e-portfolio Artifacts	685 (89.3%)	82 (10.7%)	73.69***
Students with e-portfolio Accounts but No Artifacts	361 (82.8%)	75 (17.2%)	
Control Group	515 (72.0%)	200 (28.0%)	

Note. *** $p < .001$.

Table 3

Mean Differences in Spring 2005 Cumulative Grade-Point Average and Credit Hours Earned by Group

	M	SD	F (2, 1986)
Grade-Point Average			
Students with e-portfolio Artifacts	3.03[a]	0.68	21.70***
Students With e-portfolio Accounts but No Artifacts	2.85	0.79	
Control Group	2.78	0.80	
Credit Hours Earned			
Students with e-portfolio Artifacts	63.0[b]	37.9	6.85**
Students With e-portfolio Accounts but No Artifacts	61.9[c]	40.4	
Control Group	55.7	40.4	

Note. ** $p < .01$. *** $p < .001$. a = The group of students with e-portfolio artifacts was significantly different from the other two groups at $p < .001$ (d =.06, d =.33). b = The group of students with e-portfolio artifacts was significantly different from the control group at $p < .01$ (d =.18). c = The group of students with e-portfolio accounts but with no artifacts was significantly different from the control group at $p < .05$ (d =.03). d = effect size or (M_1-M_2/SD_1), see Cohen, 1988.

Table 4

Mean Differences in Fall 2004 New Student Transition Questionnaire (NSTQ) Results by Group for Freshmen

Group	M	SD	F (2, 387)
NSTQ Social Adjustment Scale			0.123
Students With e-portfolio Artifacts	29.18	4.55	
Students With e-portfolio Accounts but No Artifacts	29.12	5.76	
Control Group	29.40	4.56	
NSTQ Academic Adjustment Scale			2.125
Students With e-portfolio Artifact	10.29	3.18	
Students With e-portfolio Accounts but No Artifacts	10.43	3.26	
Control Group	9.70	2.93	
NSTQ Satisfaction with Living Arrangements Scale			1.523
Students With e-portfolio Artifacts	11.13	2.50	
Students With e-portfolio Accounts but No Artifacts	11.67	2.40	
Control Group	11.23	2.59	
NSTQ University Involvement Scale			1.657
Students With e-portfolio Artifacts	8.88	2.46	
Students With e-portfolio Accounts but No Artifacts	9.34	1.96	
Control Group	9.30	2.27	
NSTQ Other Involvement Scale			2.328
Students With e-portfolio Artifacts	7.95	1.38	
Students With e-portfolio Accounts but No Artifacts	7.93	1.40	
Control Group	7.62	1.50	

Table 5

Mean Differences in Spring 2005 National Survey of Student Engagement (NSSE) Results by Group for Freshmen

Group	M	SD	F (2, 151)
NSSE Academic Challenge Scale			0.506
Students With e-portfolio Artifacts	56.09	13.61	
Students With e-portfolio Accounts but No Artifacts	60.11	11.23	
Control Group	55.68	10.02	
NSSE Active and Collaborative Learning Scale			0.809
Students With e-portfolio Artifact	42.46	13.62	
Students With e-portfolio Accounts but No Artifacts	44.03	15.44	
Control Group	45.96	17.16	
NSSE Student-Faculty Interaction Scale			2.611
Students With e-portfolio Artifacts	41.95	17.64	
Students With e-portfolio Accounts but No Artifacts	50.34	18.51	
Control Group	48.41	22.64	
NSSE Enriching Educational Experiences Scale			1.817
Students With e-portfolio Artifacts	28.92	11.83	
Students With e-portfolio Accounts but No Artifacts	25.09	10.17	
Control Group	30.86	12.53	
NSSE Supportive Campus Environment Scale			1.845
Students With e-portfolio Artifacts	62.65	15.63	
Students With e-portfolio Accounts but No Artifacts	69.42	13.88	
Control Group	63.98	13.18	

Table 6

Summary of Logistic Regression Analysis Predicting Retention

Predictor	B	SE	Wald
Number of Matrix Artifacts	.068	.086	.620
Total Number of Files Uploaded	.002	.097	.001

Table 7

Correlations of Spring 2005 Cumulative Grade-Point Average and Credit Hours Earned With Artifact Measures

Artifact Measure	Grade-Point Average	Credit Hours Earned
Number of Showcase Artifacts	.231*	.051
Number of Matrix Artifacts	.051	.086
Number of Artifact-Specific Reflections	.043	.190
Number of General Reflections	.230	.157
Total Number of Files Uploaded	.360***	.093*
Number of Events Posted to Calendar	.003	.021
Number of Bookmarks	-.020	.134
Number of Resumes Uploaded	.110*	.287***
Number of Times the Resume Page Was Viewed	-.134	-.134

Note. ** $p < .01$. *** $p < .001$.

(see Table 10) after background factors were controlled.

Discussion

The population of students with e-portfolios, while considerably larger than the one used for the earlier pilot study, still represents a relatively small proportion of all students at the University and is skewed in terms of several demographic and educational factors. More importantly, students' utilization of e-portfolios at BGSU remains a voluntary activity, and there is no way to control for differences in motivation between students with e-portfolios and others as comparisons are made.

Table 8

Summary of Logistic Regression Analysis Predicting Retention After Controlling for Gender, Race, Age, High School Grade-Point Average, College, and Living Arrangements

Predictor	B	SE	Wald
Gender (Female)	.324	.148	4.812*
Race (Student of Color)	-.099	.204	.237
Age	.010	.021	.225
High School Grade-Point Average	.902	.145	38.795***
College: Arts and Sciences	-.328	.187	3.075
College: Education and Human Development	.110	.167	.437
College: Musical Arts	.187	.437	.183
College: Technology	.378	.397	.904
Living Arrangements (On-Campus)	.761	.153	24.570***
e-portfolio Group (With e-portfolio Artifacts)	.730	.141	26.925***

Note. ** $p < .01$. *** $p < .001$. Change in Cox & Snell R^2 after entry of e-portfolio group = .02.

Table 9

Summary of Regression Analysis Predicting Spring 2005 Cumulative Grade-Point Average After Controlling for Gender, Race, Age, High School Grade-Point Average, ACT Score, College, and Living Arrangements

Predictor	B	SE	Wald
Gender (Female)	0.078	.034	.048*
Race (Student of Color)	-0.250	.047	-.110***
Age	0.032	.007	.104***
ACT Score	0.026	.005	.132***
High School Grade-Point Average	0.678	.037	.465***
College: Arts and Sciences	0.030	.051	.016
College: Business Administration	-0.021	.059	-.009
College: Education and Human Development	0.119	.046	.077*
College: Firelands	0.177	.229	.016
College: Health and Human Services	0.108	.068	.037
College: Musical Arts	0.143	.078	.044
College: Technology	0.144	.089	.035
Living Arrangements (On Campus)	0.076	.036	.048*
e-portfolio Group (With e-portfolio Artifacts)	0.160	.030	.106***

Note. $R^2 = .38$ ($df = 1602$, $p < .001$). Change in R^2 after entry of e-portfolio group = .02.
*$p < .05$. *** $p < .001$.

Table 10

Summary of Regression Analysis Predicting Spring 2005 Cumulative Credit Hours Earned After Controlling for Gender, Race, Age, High School Grade-Point Average, ACT Score, College, and Living Arrangements

Predictor	B	SE	Wald
Gender (Female)	1.093	1.532	.014
Race (Student of Color)	1.423	2.069	.013
Age	5.621	0.318	.374***
ACT Score	0.332	0.219	.034
High School Grade-Point Average	6.736	1.658	.093***
College: Arts and Sciences	8.785	2.252	.098***
College: Business Administration	15.111	2.614	.127***
College: Education and Human Development	8.376	2.045	.109***
College: Firelands	-21.177	10.165	-.039*
College: Health and Human Services	12.907	3.033	.089***
College: Musical Arts	52.935	3.481	.325***
College: Technology	11.888	3.934	.058**
Living Arrangements (On Campus)	-25.106	1.670	-.320***
e-portfolio Group (With e-portfolio Artifacts)	7.221	1.348	.096***

Note. $R^2 = .51$ ($df = 1602$, $p < .001$). Change in R^2 after entry of e-portfolio group = .03.
*$p < .05$. ** $p < .01$. ***$p < .001$.

Despite these limitations, the current study provides intriguing evidence about the relationship between student success and the use of e-portfolios. Its results suggest that e-portfolios may indeed serve as a key tool for providing meaningful, authentic feedback to improve student learning. More widespread use of e-portfolios might help institutions to deal with the problems noted at the beginning of this paper.

At BGSU and elsewhere, though, e-portfolios must not only be used widely among students, but all of their features must be exploited. Another major milestone in BGSU's implementation of this tool has not yet occurred (although it is in development). We are currently developing rubrics for learning outcomes and student reflections that, when implemented, will provide faculty and advisors in various disciplines a reliable measurement of student learning as documented in e-portfolios. The next phase of our research efforts will follow this implementation. Future studies will also use logistic regression to examine why some students' e-portfolio accounts include artifacts while other students' do not.

Siemens (2004) lists the conditions necessary for e-portfolios to be successfully implemented:

- The e-portfolio is viewed as a personal, learner-in-control tool. It is treated as central to the learning and assessment process.
- Learners are introduced to the concept and instructed on how to use the system (both from a technical perspective and from a "how will this help you" perspective).
- The curriculum has been designed to require learners to use the e-portfolio in completing their course work and assignments.
- The e-portfolio is used for assessment of learning objectives. Instructor feedback can be integrated back into the e-portfolio and treated as an artifact.
- Learners are provided staged advising sessions evaluating their effective use of e-portfolios (this is a meta-cognitive evaluation of e-portfolio use).
- An e-portfolio culture (Gathercoal, Love, Bryde, & McKean, 2002) exists, encouraging learners to include personal life experiences,

awards, non-academic activities, and other character/ learning revealing artifacts in their e-portfolios.

- Dialogue, debate, discussion, and examples of e-portfolio use are common.
- Time is allotted for e-portfolio development.
- Faculty understand and promote the value of e-portfolios.
- Technical details are well managed, resulting in a simple, positive end-user experience.

At BGSU and across most colleges and universities, we are at the early stage of creating such conditions. Time will tell whether e-portfolios will fully realize their potential to improve student learning.

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