Using digital academic profiles for assessing the quality of education and creating a competitive workforce

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Abstract

As businesses increasingly seek employees skilled at multitasking, colleges must develop students who master new digital proficiencies and business techniques. The glaring implication is that colleges and universities must go a step further to adapt and respond appropriately to the challenges and opportunities of workforce demands. Coordinating data collection of key performance indicators supports instructional planning and establishes proper protocols for aligning curriculum with industry standards. Student enrollments, course selections, digital fingerprints online, and participation in college clubs all produce a gold mine of data. A more granular look at these interactions reveals greater insights about student needs, interests, and motivations. Ongoing assessment improves performance and presents a more comprehensive picture of students' academic progress.

The purpose of this paper is to explore how digital assessment develops a more accurate measure of excellence, change the dynamics of academic review, and produce competitive students. Summative assignments do not measure business skills such as teamwork, networking, collaboration, and character traits which are increasingly important for participation in the working world. Profiles of students' aspirations and career objectives are equally as important as course completion because they represent the student's personality, talents, and professional behavior.

This research presents the "Digital Academic Profile" (DAP), a new disruptive phenomenon for reporting student accomplishments as they matriculate from admission to graduation. DAPs' qualitative analytics enrich dialogues about student achievement and create opportunities for educational constituents to efficiently design learning that improves student performance. Applying a multi-perspective theoretical view, this research relies on the principles of participatory epistemology, heuristic evaluation, and disruptive innovation to determine the reliability and validity of the DAIS potential to increase educational productivity.

1. The Introduction

In recent years, the rapid increase in the use of technology and digital communications has led to strategic advantages for business, professions, education, and society. Schools and state agencies have recognized the need to proactively capitalize on the use of technology to guide educational decision making and better manage critical academic data (Marsh, 2012). The Association of American Colleges and Universities (2009) believes that valid assessment data are needed to guide planning, teaching, and improvement. Well-planned data collection methods establish new assessments metrics and lead institutions in achieving expected goals (Association of American Colleges and Universities, 2009). Researchers and educators have found that digital tools which make our lives inherently efficient also helps to appropriate information in ways that improve the quality of education (Hu, 2017).

To connect data to educational outcomes is to use an outcomes assessment plan that includes evaluating core competencies and student achievement based on curricular and co-curricular activities throughout a student's college life. A comprehensive performance assessment system is an excellent method for displaying a student's true potential and ability (Meisels, 1997). The states of Vermont and Kentucky began to investigate the possibility of using portfolio assessments instead of standardized tests to judge educational achievement. Zayed University researchers developed an e-portfolio assessment system for an information technology degree program. Zayed required students to create an e-portfolio and showcase significant course work as digital artifacts (Tubaishat, et al., 2009). The research proved that in time, e-portfolios would become an essential source of information for evaluating the effectiveness of student outcomes.

Delandshere (2002) pointed out there had been years of arguments regarding the need for new forms of educational assessment due to "an almost unanimous recognition of the limitations of current measurement theory and practice." Those who perform educational metrics work from old methodologies and perspectives. In fact, the history of grading point average (GPA) in American colleges dates back to the 1700s when Yale University formulated it, then finalized in the 1800s (Durm, 1993). Excluded from traditional grading systems are specific notions of learning, knowing, and inquiry, and the conditions necessary to foster productive learning experiences.

According to Dr. Samuel Meisels, a renowned Harvard scholar on assessment, "most standardized tests are not designed to evaluate the individualized growth and development taking place in your classroom" (Meisels, 1997). Dr. Meisels advocates for portfolios and "purposeful collections" of student's work that "illustrate their efforts, progress, and achievements." Such portfolios provide rich documentation of the student's experiences throughout the year and lead to the development of new activities based on the student's progress and interests. By collecting portfolio items on multiple occasions, it becomes a tool for documenting, analyzing, and summarizing student growth and development.

Early research from the Coalition of Essential Schools and the Annenberg Institute for School Reform identify assessment and technology as two core factors in the successful implementation and use of e-portfolios (Niguidula, 1997). As the concept of portfolio assessment expands, technology makes way for the transformative process of digital assessment. This research will explore the efficacy of a digital assessment information system (DAIS) for enhancing the grade reporting process, reflect more accurate measures of excellence, expand the portfolio assessment model, and change the dynamics of academic review.

2. Revolutionizing Assessment Methods

ACT, Inc., formerly the American College Testing (ACT) recently conducted tests for more than 2 million (or 64 percent) of high school graduates becoming the most popular assessment used to predict college performance. In their 2012 report about major preferences and prospects, nearly 80% of high school students selected a major they intended to declare in college, but 64% of those students choose a major that did not fit with their academic strengths and interests (ACT, Inc., 2013). Similarly, about 90% of low-income, first-generation students do not graduate within six years because they are likely unfamiliar with the "hidden curriculum" that determines students' success in their major or perhaps working more than 20 hours per week to finance their education (Education Advisory Board, 2016). Jon Erickson, ACT president of education and career solutions believes that choosing a college major reflective of students' interests gives them a better chance of succeeding and could also contribute to their satisfaction in school and on the job.

Given that standardized tests are a snapshot of learning at two points in time, little information from these tests are used to guide pedagogical and curricular improvements (Humphreys, 2009). More research is necessary to address the problems colleges and universities face with poorly designed curricula that does not align to workforce demands. Educational reform policies, particularly in urban institutions mandate more effective accountability programs (Porter, et

al., 2004). Tremendous pressure is placed on academic institutions to provide an education leading to gainful employment, given the soaring price of tuition. The Association of American Colleges and Universities (AACU) is using their Liberal Education and America's Promise (LEAP) initiative and the Valid Assessment of Learning in Undergraduate Education (VALUE) project to explore an alternative approach for assessing learning. VALUE assumes that "well-planned e-portfolios can inform programs and institutions about their [students] progress to achieve expected goals." AACU seeks to report aggregate findings to internal and external audiences on a "broad range of outcomes associated with the global and complex world in which we live" (Humphreys, 2009).

Furthermore, accreditations organizations, such as North Central Association of Colleges and Schools are requiring academic institutions to present a better method for assessing students' learning outcomes with a focus on general education courses (Tubaishat, et al., 2009). Most colleges and universities have an abundance of data but need the capacity to turn data into meaningful information. When considered in conjunction with interoperability standards, academic data can be dispersed in mini-systems throughout the functional units of an institution to create a more extensive process than usual for performing program assessment. At any given college, there are dozens of databases, not counting the research databases and course management systems holding a wealth of assessment metrics.

The ubiquity of electronic communications makes the collection of student data intuitive. For many institutions, finding the resources for normalizing and warehousing data and the expertise to set up a robust assessment system can be challenging. The lack of technology skills by academicians is another challenge. Pechone & Chung (2006) warns that it is insufficient to measure student achievement with only course grades. Student learning must be tied to goals and objectives in a systematic process. Authentic assessment requires cross-program collaboration and communication to effect institutional change. This imperative, if done appropriately, will advance institutional review far beyond the goal of conforming to accreditation (Buzzetto-More, 2010). It will help to validate what students have learned and measure the academic intensity of degree programs.

A digital system is a more rapid and reliable assessment process for creating measurable relationships and continuous improvement (Diamond & Gardiner, 2000; Marsh, 2012). Several academic institutions have adopted the outcome based educational model to move away from the GPA driven model. DAIS also adopts the outcome-based model, but instead of moving away from the GPA, includes additional curricular and non-curricular factors in a continuous cycle of collection, organization, and interpretation of data to determine whether degree programs produce the types of graduates, colleges state in their mission, goals, and objectives. In a four-phase process, DAIS 1) establishes non-traditional measurable outcomes of student learning, 2) ensures that students have adequate opportunities to achieve these outcomes, 3) gathers, analyzes and interprets learning artifacts to determine how well it matches program goals, and 4) uses the resulting algorithms for performance reporting. The goal of DAIS is to establish stronger symmetry between learning and program goals and put in the hands of academicians a digital tool that will revolutionize the assessment review process.

2.1 The Electronic Portfolios Assessment Model

The use of electronic portfolios in higher education institutions has been steadily increasing due to campus saturation with digital technologies. E-portfolios are purposeful aggregations of digital artifacts that articulate student experiences, achievements and learning. They may be the most significant technological innovation on college campuses for evaluating performance and exposing enormous possibilities for re-thinking curricula, instruction, and assessment. By 2004 approximately 70% of higher educational institutions were implementing or using some form of e-portfolio (Lorenzo & Ittelson, 2005). Didactical implications for using e-portfolios are to diversify student-centered learning and create higher quality outcomes. In 2011, the Electronic Portfolio Action & Communication (EPAC) team at Stanford University surveyed higher education institutions to

determine their purposes for adopting e-portfolios. The results revealed nine categories for college use. Table 1 sorts these categories from greatest to least used.

Table 1

#	CATEGORY
1	Institutional and programmatic assessment
2	Documentation of student learning
3	Career development
4	Integrative learning/interdisciplinary learning
4	Course management
6	General education
7	Reflection
8	Professional development
9	Transfer

2011 Stanford University EPAC Survey: Categories of E-Portfolio Use in Higher Education

Stanford University categories help coordinate assessment efforts with standards-based protocols for the institution. Other educational institutions see the broad impact of performing portfolio based assessment. The "Urban Universities Portfolio Project" was the first to explore institution-wide e-portfolios for assessment and accreditation (Cambridge, 2001). Subsequently, the Western Association of Schools and Colleges also encouraged institutions to use e-portfolios for accreditation. As the phrase "portfolio thinking" emerged, it became the mindset institutions adopt in its assessments practices to create a culture of analysis, interpretation, and reflection (Holland, 2002).

2.2 Digital Academic Profiles

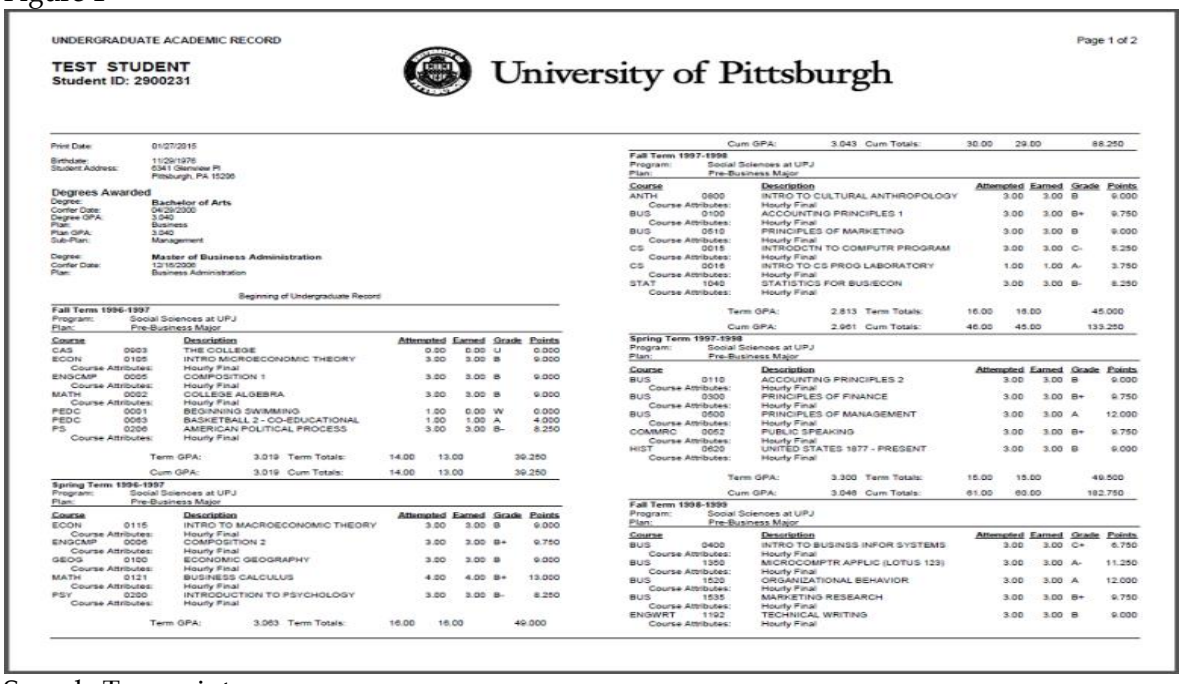
While portfolios are aggregations of artifacts representing accomplishments, profiles are representative of the subject's character, interest, and performance. Digital profiles allow for multimedia representations of content. In the Internet world, they are the heart of social media and used to showcase an individuals' characteristics. The Pew Research Center report "Social Media Use in 2018" show that "88% of 18- to 29-year-olds indicate that they use any form of social media" which require the creation and use a digital profile. Online career centers require prospective employees to highlight key components of their career experiences, skills, and goals in a digital profile to match their qualifications with job openings. The new reality is that a well-designed digital profile demonstrates professionalism and is an asset to building an individual's brand.

ACT set new benchmarks with its "interest-major fit" score predicting student outcomes. Encouraging the use of behavioral assessments to help identify noncognitive impediments to success, they review factors of: 1) motivation and skills, 2) social engagement, and 3) self-regulation. Research at ACT and elsewhere suggests that if students' measured interests match interests of people in their career, they will be more likely to remain in their major, persist in college, and complete a college degree in a timely manner (ACT, Inc., 2016).

Within DAIS, the digital academic profile (DAP) merges the concepts of e-portfolios and digital profiles to represent students' broad performance. It is an assessment product that looks at formal and informal student learning and behaviors to reveal greater academic insights. The DAP includes the traditional transcript data as well as digital artifacts highlighting special accomplishments, and participation data. Other sections of the report contain information about performance in co-curricular, extracurricular and service learning activities (sports, events, conferences, student groups, etc.). A student section allows for an explanation of career interests and goals. The digital aspect of DAP makes it interactive and shareable in full or in part, and interactive. In addition to the GPA, DAPs will contain a Performance Assessment Symmetry Score (PASS) a

multi-factor analysis of student's performance throughout their college life. Figure 1 shows a sample current form of an academic transcript.

Figure 1



UNDERGRADUATE ACADEMIC RECORD

Page 1 of 2

TEST STUDENT
Student ID: 2900231

University of Pittsburgh

Print Date: 01/27/2015
Birthdate: 11/29/1976
Student Address: 6341 Glenelder Pl
Pittsburgh, PA 15206

Degrees Awarded

Degree: Bachelor of Arts
Confer Date: 04/29/2000
Degree GPA: 3.040
Plan: Business
Plan GPA: 3.040
Sub-Plan: Management

Degree: Master of Business Administration
Confer Date: 12/15/2006
Plan: Business Administration

Beginning of Undergraduate Record

Fall Term 1996-1997
Program: Social Sciences at UPJ
Plan: Pre-Business Major

Course		Description	Attempted	Earned	Grade	Points
CAS	0903	THE COLLEGE	0.00	0.00	U	0.000
ECON	0105	INTRO MICROECONOMIC THEORY	3.00	3.00	B	9.000
Course Attributes:		Hourly Final				
ENGCMP	0005	COMPOSITION 1	3.00	3.00	B	9.000
Course Attributes:		Hourly Final				
MATH	0092	COLLEGE ALGEBRA	3.00	3.00	B	9.000
Course Attributes:		Hourly Final				
PEDC	0001	BEGINNING SWIMMING	1.00	0.00	W	0.000
PEDC	0063	BASKETBALL 2 - CO-EDUCATIONAL	1.00	1.00	A	4.000
PS	0206	AMERICAN POLITICAL PROCESS	3.00	3.00	B-	8.250
Course Attributes:		Hourly Final				

Term GPA: 3.019 Term Totals: 14.00 13.00 39.250
Cum GPA: 3.019 Cum Totals: 14.00 13.00 39.250

Spring Term 1996-1997
Program: Social Sciences at UPJ
Plan: Pre-Business Major

Course		Description	Attempted	Earned	Grade	Points
ECON	0115	INTRO TO MACROECONOMIC THEORY	3.00	3.00	B	9.000
Course Attributes:		Hourly Final				
ENGCMP	0006	COMPOSITION 2	3.00	3.00	B+	9.750
Course Attributes:		Hourly Final				
GEOG	0100	ECONOMIC GEOGRAPHY	3.00	3.00	B	9.000
Course Attributes:		Hourly Final				
MATH	0121	BUSINESS CALCULUS	4.00	4.00	B+	13.000
Course Attributes:		Hourly Final				
PSY	0200	INTRODUCTION TO PSYCHOLOGY	3.00	3.00	B-	8.250
Course Attributes:		Hourly Final				

Term GPA: 3.063 Term Totals: 16.00 16.00 49.000
Cum GPA: 3.043 Cum Totals: 30.00 29.00 88.250

Fall Term 1997-1998
Program: Social Sciences at UPJ
Plan: Pre-Business Major

Course		Description	Attempted	Earned	Grade	Points
ANTH	0800	INTRO TO CULTURAL ANTHROPOLOGY	3.00	3.00	B	9.000
Course Attributes:		Hourly Final				
BUS	0100	ACCOUNTING PRINCIPLES 1	3.00	3.00	B+	9.750
Course Attributes:		Hourly Final				
BUS	0510	PRINCIPLES OF MARKETING	3.00	3.00	B	9.000
Course Attributes:		Hourly Final				
CS	0015	INTRODCTN TO COMPUTR PROGRAM	3.00	3.00	C-	5.250
Course Attributes:		Hourly Final				
CS	0016	INTRO TO CS PROG LABORATORY	1.00	1.00	A-	3.750
Course Attributes:		Hourly Final				
STAT	1040	STATISTICS FOR BUS/ECON	3.00	3.00	B-	8.250
Course Attributes:		Hourly Final				

Term GPA: 2.813 Term Totals: 16.00 16.00 45.000
Cum GPA: 2.961 Cum Totals: 46.00 45.00 133.250

Spring Term 1997-1998
Program: Social Sciences at UPJ
Plan: Pre-Business Major

Course		Description	Attempted	Earned	Grade	Points
BUS	0110	ACCOUNTING PRINCIPLES 2	3.00	3.00	B	9.000
Course Attributes:		Hourly Final				
BUS	0300	PRINCIPLES OF FINANCE	3.00	3.00	B+	9.750
Course Attributes:		Hourly Final				
BUS	0600	PRINCIPLES OF MANAGEMENT	3.00	3.00	A	12.000
Course Attributes:		Hourly Final				
COMMRC	0052	PUBLIC SPEAKING	3.00	3.00	B+	9.750
Course Attributes:		Hourly Final				
HIST	0620	UNITED STATES 1877 - PRESENT	3.00	3.00	B	9.000
Course Attributes:		Hourly Final				

Term GPA: 3.300 Term Totals: 15.00 15.00 49.500
Cum GPA: 3.048 Cum Totals: 61.00 60.00 182.750

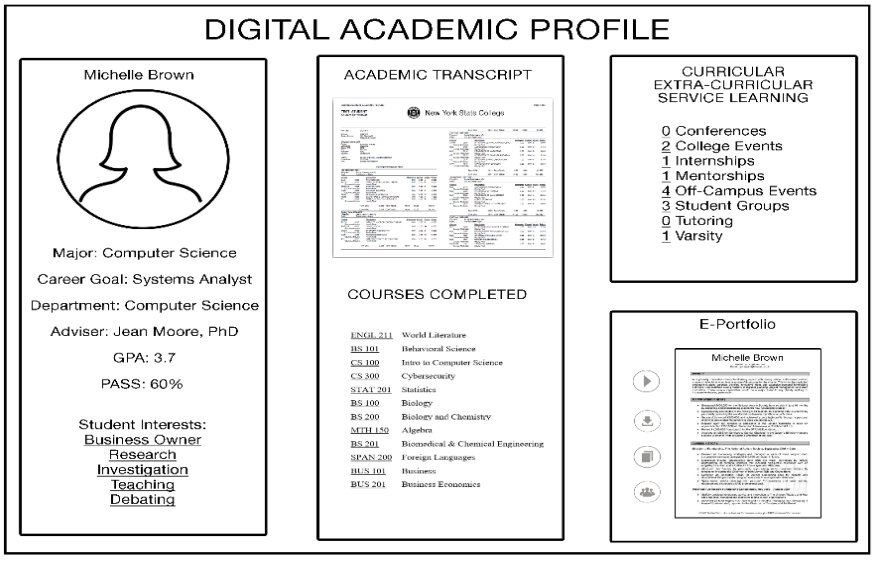
Fall Term 1998-1999
Program: Social Sciences at UPJ
Plan: Pre-Business Major

Course		Description	Attempted	Earned	Grade	Points
BUS	0400	INTRO TO BUSINSS INFOR SYSTEMS	3.00	3.00	C+	6.750
Course Attributes:		Hourly Final				
BUS	1350	MICROCOMPTR APPLIC (LOTUS 123)	3.00	3.00	A-	11.250
Course Attributes:		Hourly Final				
BUS	1520	ORGANIZATIONAL BEHAVIOR	3.00	3.00	A	12.000
Course Attributes:		Hourly Final				
BUS	1535	MARKETING RESEARCH	3.00	3.00	B+	9.750
Course Attributes:		Hourly Final				
ENGWRT	1192	TECHNICAL WRITING	3.00	3.00	B	9.000
Course Attributes:		Hourly Final				

Sample Transcript

Figure 2 shows the DAP prototype which has more robust information about a student's performance. A student has the option of granting DAP open access to employers or restricting access in full or in part with a personal identification number (PIN). The full transcript and resume may be downloaded. Numeric values next to activities link to information describing the events. Links under the student interests display the student's rationale. Links next to courses codes connect to course objectives. The department name connects to the department mission statement. The name of the major connects to the program goals and objectives.

Figure 2



DAP[tm] Prototype

2.3 Theoretical Framework

DAIS and DAPs are disruptive paradigms expected to influence educational policy and significantly challenge institutional assumptions about assessment and student learning. To support colleges and universities and design a systematic process for improving outcomes, this research adopts more than one theoretical framework to broaden discussions within the research community. To uncritically apply alternative explanations from varying points of view, it uses a participatory epistemology, heuristic evaluation, and disruptive innovation principles. Table 2 shows the theoretical implications.

Table 2

THEORY	Participatory Epistemology	Heuristic Evaluation	Disruptive Innovation
Impact	Learners	Software	Assessment
Method	Evaluate subjects as they participate in learning activities.	Evaluate the design and usability of DAIS.	Evaluate institutional DAIS practices.
Analysis	Quantify and qualify student performance in curricular, co-curricular, and service learning.	Correlate usability with institutional outcomes.	Perform a cost benefit analysis.
	COGNITIVE	INTUITIVE	PRACTICAL

2.4 System Design & Data Analysis

The user will be able to use DAIS to collects a matrix of performance data at varying functional levels for review and tracking, in much of the same way e-portfolio information is collected. Colleges capture a vibrant picture of student development and progress in and out of classrooms. The institution will have a record of learning and performance from admission through graduation. Data about courses and programs are incorporated as base information. Career and personal interest data are entered by students. Grades and course performance scores are entered by faculty members. Co-curricular and extra-curricular participation data is entered by the specified unit (ex: athletics, sorority, fraternity, mentor, internship, etc.) In raising the quality of program review, DAIS creates key performance indicators not captured by classroom assessments.

By strategically incorporating stakeholder objectives, DAIS aligns student performance with industry skills (communication, critical reading, quantitative reasoning and problem-solving etc.), and program outcomes with accreditation standards. The system will analyze whether a program is achieving the required levels and if not, where improvement is needed. Recommendations from these program reviews can become part of a program's strategic planning efforts. Listed below are the data items (objectives, measures, activities, and scores):

Performance Objectives (PO) are the knowledge, skills and abilities students are expected to accomplish.

Agency performance objectives (APO) are specific POs as determined by accreditation and industry standards;

Program objectives (PPO) are POs as determined by the degree program; and

Course objectives (CPO) are POs as determined by each course.

Performance Measures (PM) are graded course assignments used to assess learning.

Exams – interim tests that contain (multiple/choice, true/false, fill-in the blanks, matching questions, etc.);

Written reports – research reports and essays that are not a part of an exam; and

Projects – presentations, case studies, and comprehensive assignments; and

Term grades – total student grade for each course.

Performance-Based Activities (PA) represent student participation in activities outside of the classroom that support learning.

Campus events – that are discipline-specific, college-specific, industry-specific, general activities;
Off-campus events – that are discipline-specific, college-specific, industry-specific;
Varsity – participation in sports as an athlete; and
Service learning – internships, externships, college work study.
Performance Scores (PS) are calculated ratios and scores from the performance measures and performance-based activities in student e-portfolio artifacts.
Student Performance Score (SPS) – is an individual score from each PM.
Course Performance Score (CPS) – collection of scores from all students within a course.
Aggregate Performance Score (APS) – collection of scores from all students within a program; and
Performance Assessment Symmetry Score (PASS) – the calculated symmetry score between student learning, student performance, and degree program outcomes. This score represents an interest-major fit and student success factor.

Table 3 shows the data points, purposes, data analysis metrics, and type of variables. The Metric column indicates the codes: C-Causal. D-Descriptive, E-Exploratory, I-Inferential, M-Mechanistic, and P-Predictive. The Type column indicates the variable codes: D-Dependent, I-Independent, Me-Mediator, and Mo-Moderator.

Table 3

Data	Definition	Metric	Type
Program Objectives	knowledge and skills to be acquired by end of the program	D	Mo
Course Objectives	knowledge and skills to be acquired by end of the course	D	Mo
Agency Objectives	accreditation and industry standards	I, P	Mo
Student Outcomes	Performance scores (grades, participation in activities)	D, E, I	D
Program Outcomes	Program metrics (graduation rates, retention, enrollments)	D, E, l	D
DAIS Use	Measured system use	C, D	I
DAIS Competency	Capacity at which DAIS is used effectively	M	I
Assessment Competency	Ability of DAIS user to correlate objectives to outcomes	M	I
Program Assessment	the evaluation of program goals, objectives and outcomes	D	I
Subject Dissonance	incompatibility between major and student performance	I, P	Me
Program Dissonance	incompatibility between program and agency objectives	I, P	Me
Agency Symmetry	ratio between the agency standards and program objectives	I, P	D
Program Symmetry	ratio between program and course objectives	I, P	D
Student Symmetry	ratio between course objectives and student interests	I, P	D
Performance Assessment Symmetry Score (PASS)	Overall symmetry score between program objectives and student outcomes	I, P	

DAIS Data Analysis

The data analysis will include a review of student, faculty and agency perceptions of DAPs, student symmetry scores in DAPs, outcomes assessment and the usefulness of the DAIS. The performance matrix and associated symmetry scores will be analyzed to determine how well the DAIS captures performance variables, correlate them to improvements in assessment methods and to create a sustainable digital process for program review. The overall system analysis will include: 1) user statistics, 2) symmetry reports, 3) academic outcomes, and a 4) cost-benefit analysis.

3. Discussions and Conclusions

When students drop out of college programs, it's disappointing for the college and student but also for business, government, and society due to detrimental costs and implications for everyone. Financial aid and poor secondary school preparation are cited as top issues for college drop-outs, but the third most prominent reason is that students are not convinced of the major. The largest student loan debts, totaling $1.3 trillion, are those of college dropouts who took out loans hoping for a better life. Low income students need special attention with staying in school and

finding jobs. Without the degrees, it ruins students chances of getting a good job and paying back these loans (The Hechinger Report, 2017).

3.1 DAIS Retention Strategies

DAIS is a cross-campus effort that supports academic advising, early alert, first-year retention, and institutional data analysis. All college constituents, faculty, staff, and administrators must align their functional areas to support assessment initiatives. Each department must share in the commitment to helping students succeed. DAIS will use a web-based interface for capturing performance data across the institution. Users have the options of entering data or running performance reports online and remotely. Faculty, registrars, admission officers, advisers, and students all have access to student DAPs. Career counselors are only part of the network for helping students succeed in the workforce. Colleges that create campus-wide retention programs have a clear strategy for identifying at-risk students and early intervention.

3.2 Research Aims & Objectives

The underlying aim is to study the effectiveness of digital program assessment. The research answers question abou the use of a digital assessment information system. The objectives of the study are:

- To examine the role of digital assessment in measuring student performance.
- To examine the role of digital assessment in program review.
- To identify digital methods for improving assessment.
- To increase symmetry between program objectives and stakeholder expectations.
- To increase symmetry between course objectives and student goals.
- To increase symmetry between student goals and major selection.
- To increase symmetry between student goals and student performance.
- To develop a sustainable process for student performance reporting.

3.2 Research Questions

It is expected that this research will demonstrate how well digital assessment enhances program review, increases symmetry between student outcomes and student choice of major, and increases symmetry between program objectives and external standards. The following questions are addressed by this research:

Does a DAIS benefit higher education institutions?

How does digital assessment measure student achievement?

Under what conditions can digital artifacts be used for program assessment?

What are the benefits of using digital assessment as perceived by faculty members and college administrators?

What are perceived obstacles to implementing digital assessment and how can they be overcome?

What are the skills necessary to effectively implement digital assessment?

What are the characteristics of the students in the program?

What are institution's accreditation compliance standards?

How does the institutional align program objectives with external stakeholder (employers) expectations?

How well does the assessment of student learning improve students' chances of success in the workforce?

4. Research Limitations and Direction for Further Research

This research is an in-process study of the digital assessment process. The population involved in this research will be limited to those will use the prototype DAIS customized for the study. Results of this study is limited to institutions who make full use of e-portfolios. The results may not be generalizable for institutions who do not follow a "portfolio thinking" approach. Agency

data includes the collection of accreditation associations standards and industry skillsets for fit factor analysis. At present no colleges are using DAPs to represent student performance. Negative perceptions about digital assessment and e-portfolios may affect system outcomes. Insufficient data points will affect symmetry and yield false positives. Colleges must conduct their own cost benefit analysis, feasibility studies (technical, economic, and operational).

While DAIS attempts to allow for programmatic interventions, students who change majors midstream may affect their overall PASS and fit symmetry. Discomfort with entering data into an assessment information system may also hinder an institution's potential for program symmetry. Attempts to minimize the impact of these limitations and acknowledge the potential limitations is unique for each institution. Future research should evaluate collaborations between academic institutions and external stakeholders, and the impact businesses and industry have on college curriculum.

5. References

ACT, Inc., 2013. A Profile of 2012 ACT-Tested High School Graduates: College Choice Report Part 1 - Preferences and Prospects, Iowa City: ACT, Inc..

ACT, Inc., 2016. ACT College Choice Report: Class of 2015, Iowa City: ACT, Inc..

Association of American Colleges and Universities, 2009. VALUE: Valid assessment of learning in undergraduate education. [Online]

[Accessed 1 May 2013].

Barrett, H., 2006. Researching and Evaluating Digital Storytelling as a Deep Learning Tool. s.l., s.n.

Barrett, H., 2011. Balancing the two faces of e-portfolios. In: Innovations in Education (2nd Edition). s.l.:British Columbia Ministry of Education.

Battenfield, S., 2012. Is a Digital Portfolio Really Worth It?. Sacramento, California State University.

Buzzetto-More, N., 2010. The E-Portfolio Paradigm: Informing, Educating, Assessing and Managing with E-Portfolios. Santa Rosa: Informing Science Press.

Cambridge, B., 2001. Electronic portfolios: Emerging practices in student, faculty, and institutional learning. Washington: Stylus Publishing.

Delandshere, G., 2002. Assessment as Inquiry. Teachers College Record, 104(7), pp. 1461-1484.

Diamond, R. M. & Gardiner, L. F., 2000. Curriculum review, Rutgers: The National Academy for Academic Leadership, Rutgers University.

Durm, W. A., 1993. An A is Not an A is Not A: The History of Grading. The Educational Forum, Spring.Volume 57.

Education Advisory Board, 2016. 90% of low-income, first-gen students don't graduate on time. But colleges can change that. [Online]

Available at: https://www.eab.com/daily-briefing/2016/03/16/90-percent-of-low-income-first-gen-students-dont-graduate-on-time-but-colleges-can-change-that

Goodhue, D. & Thompson, R., 1995. Task-technology fit and individual performance. MIS Quarterly, 19(2), pp. 213-238.

Herman, J. L. & Winters, L., 1994. Portfolio Research: A Slim Collection. Reporting What Students Are Learning, October, 52(2), pp. 48-55.

Holland, B., ed., 2002. Metropolitan Universities: An International Form. Urban Universities Portfolio Project, 13(3).

Hu, C., 2017. Students, computers and learning: Where is the connection?. Education Information Technologies, 22(6), p. 2665–2670.

Humphreys, D., 2009. Assessing Learning Outcomes: Lessons from AAC&U's VALUE Project. Peer Review: Emerging Trends and Key Debates in Undergraduate Education, 11(1).

Jafari, A., 2004. The "Sticky" ePortfolio System: Tackling Challenges and Identifying Attribute. Educause, July/August, 39(4), pp. 38-49.

Knefelkamp, L. L., 1989. ASSESSMENT AS TRANSFORMATON. Atlanta, s.n.

Leonard, D. M. & Norris, J., 2008. What Every Campus Leader Needs to Know, Herndon: Strategic Initiatives, Inc..

Lorenzo, G. & Ittelson, J. C., 2005. An Overview of EPortfolios, Washington: Educause Learning Initiative.

Marsh, J., 2012. Interventions Promoting Educators' Use of Data: Research Insights and Gaps. Teachers College Record, 114(110303).

McNeil, L., 2000. Sameness, bureaucracy, and the myth of educational equity: The TAAS system of testing in Texas public schools. Hispanic Journal of Behavioral Sciences, 22(4), pp. 508-523.

McNeil, L. M., 2000. Contradictions of school reform: Educational costs of standardized testing. New York: Routledge.

Meisels, S. J., 1997. Using Work Sampling in authentic performance assessments. Educational Leadership, Volume 54, pp. 60-65.

Niguidula, D., 1997. Picturing performance with digital portfolios. Educational Leadership, 55(3), pp. 26-29.

Norris, D. & Leonard, J., 2008. What Every Campus Leader Needs to Know About Analytics, Herndon: Strategic Initiatives, Inc..

Pechone, R. L. & Chung, R., 2006. Evidence in Teacher Education. Journal of Teacher Education, 57(1), pp. 22-36.

Porter, A., Chester, M. & Schlesinger, M., 2004. Framework for an Effective Assessment and Accountability Program: The Philadelphia Example. Teachers College Press, June, 106(6), pp. 1358-1400.

Shepard, L. A. & Smith, M. L., 1989. Flunking grades: Research and policies on retention. Philadelphia: Falmer Press.

Smith, M., 1991. Put to the test: The effects of external testing on teachers. Educational Research, 20(5), pp. 8-11.

Stringer, E. & Genat, W. J., 2004. Action research in health. New Jersey: Pearson Education.

The Hechinger Report, 2017. 3.9 Million Students Dropped Out of College With Debt in 2015 and 2016, Washington: U.S. News.

Topi, H. et al., 2010. Curriculum Guidelines for Undergraduate Degree Programs in Information Systems. Association for Computing Machinery and Association for Information Systems.

Tubaishat, A., Lansari, A. & Al-Rawi, A. A., 2009. E-portfolio Assessment System for an Outcome-Based Information Technology Curriculum. Journal of Information Technology Education, Volume 8, pp. 43-54.

Waterman, E., 2002. Beyond the Administrative Core: Creating Web-based Student Services for Online Learners., Denver: Regis University.

Wholey, J. S., Hatry, H. & Newcomer, K., 2010. Handbook of Practical Program Evaluation. San Francisco: Jossey-Bass.