The Foundation of MAP-Works
Research and Theoretical Underpinnings of MAP-Works

This paper explores the theoretical constructs used in the development of the MAP-Works platform, in addition to the statistical foundations for the work. It also contains a brief history of MAP-Works.

10/15/2012
# Table of Contents

- What is MAP-Works? ........................................................................................................... 3
- Why was MAP-Works Developed? ..................................................................................... 3
- Making Achievement Possible (MAP) .................................................................................... 4
- A Partnership to Develop MAP-Works ................................................................................ 4
- Theoretical Foundation of MAP-Works .............................................................................. 6
- Statistical Foundation of MAP-Works .................................................................................. 7
- Development of the MAP-Works Risk Indicator .................................................................. 10
- References .......................................................................................................................... 11
What is MAP-Works?

MAP-Works® is a web-enabled, comprehensive, integrated, student retention and success platform created through a partnership between EBI MAP-Works and Ball State University. MAP-Works capitalizes on Ball State’s 20+ years of experience with the original Making Achievement Possible (MAP) program and EBI MAP-Works’ expertise in national benchmarking assessments. MAP-Works empowers faculty/professional staff to impact student success and retention while directly educating students about transition issues.

MAP-Works empowers campus professionals to efficiently and effectively:
- Identify at-risk students early in the fall term to have the greatest impact on retention and student success.
- Intervene with at-risk students by minimizing the time required to diagnose problems and targeting relevant issues to maximize the effectiveness of time spent helping students.
- Evaluate the at-risk status of students continuously throughout the academic year by combining course performance and class attendance information from faculty, information about social/emotional issues and academic behaviors from students, and institutional information regarding term outcomes including GPA, persistence and credits earned.
- Enhance interactions through appointment scheduling and phone/pad apps to facilitate communication and delivery of information.
- Coordinate efforts among faculty and staff who have direct-connect relationships with students through the use of notes, referrals, and contacts.
- Capture “referrals” for real-time prioritization of at-risk students.
- Engage students through personalized feedback and tools to assign tasks.
- Analyze aggregate data regarding student experiences, benchmark results with peer institutions, and generate customized reports to support campus initiatives and make informed decisions regarding student success programs and retention services.

MAP-Works empowers students to:
- Recognize gaps between their behavior and their expected outcomes.
- Gain insights about themselves through social-norming.
- Understand the elements which impact their social and academic success.
- Reach out and utilize on-campus resources which can help them address their issues.

Why was MAP-Works Developed?

The first year of college sets the tone for what students expect, how much they get involved, and what they experience (Pascarella & Terenzini, 1992). Therefore, colleges develop various programs to support student success, particularly in the first year. Tinto (1993, p. 171) notes that “Prompt feedback to students and to those who can assist students is an essential element in the effectiveness of these systems.” Thus, institutions focused on student success, first-year and beyond, must gather quality information about students, provide prompt feedback to students and staff, work collaboratively to make the most of resources, and create numerous opportunities for interventions and interactions that facilitate student learning.


Tinto’s Theory of Student Retention

“If we have learned anything over the years in our attempts to improve student retention, it is that the earlier one attends to a problem or potential problem, the easier it is to deal with that problem and the less likely it is that it will manifest itself in the form of student withdrawal.” Tinto, 1993, p. 171

“To be effective, institutions have to put in to place the resources needed to quickly respond to students before the first year is well underway.” Tinto, 1993, p. 162-3
Making Achievement Possible (MAP)

Development of MAP: In 1988, Ball State University developed a collaborative survey project to gather and provide quality information about students and to share the responsibility for student success. The project was entitled Making Achievement Possible (MAP) because it was structured, literally, to help make student achievement possible and to focus on early interventions.

In 1988, Ball State University identified three main areas of concern regarding their incoming first-year students.

- **Unrealistic Expectations:** Many incoming students had unrealistic expectations of what college would be like. For instance, many students expected to earn high grades without significant effort, they did not expect any roommate or social adjustment issues, or they did not understand the amount of effort needed to manage their time and their lives.

- **Retention Rates:** Ball State’s second concern was its retention rate and the limitations of existing methods for spotting student issues early enough to affect student retention. For instance, mid-term deficiency reports, available in late October, highlighted academic issues that were very serious, but the timing was too late for effective interventions. Also, existing methods missed non-academic issues such as homesickness and social integration.

- **Better Information:** Ball State’s final concern centered on a desire for a better understanding of the characteristics of the incoming class in order to identify programming needs and create new initiatives that would help students succeed.

With those concerns in mind, they developed three action items:

- Create earlier intervention opportunities between faculty/staff and first-year students
- Educate students on the behaviors needed to be successful at Ball State
- Gather systematic information on the characteristics of the first-year student population

To achieve these goals, a development committee, comprised of 15 faculty and staff from Academic Assessment and Institutional Research, Housing and Residence Life, and University College (both Academic Advising and the Learning Center) was established. The first version of MAP was piloted during the fall of 1989. The content for the survey instrument, as well as the reports provided to students and staff, were developed through an iterative process using panels of experts, research literature (both theoretical works and research studies), scans of other instruments, as well as local expertise. After several iterations, a standard for MAP evolved. The administration of MAP was during the third or fourth week of classes, and the survey instrument was made up of 160 items. Reports were sent to individual students, their residence hall staff, and their academic advisors.

In 1999, Sherry Woosley, Ph.D. was hired in Ball State’s Office of Academic Assessment and Institutional Research and became the Project Director of MAP. Between 1999 and 2004, she undertook an extensive, systematic analysis of MAP data exploring the relationships between the data and outcomes. She also oversaw additional assessments of the project exploring student, faculty, and staff perspectives. Based on that information, numerous modifications were made to reporting. Throughout those years, Dr. Woosley not only used her work to make campus improvements, she also published her work (see list of references) and discussed MAP, its findings, and future implications at various national and regional conferences.

In 2004 and 2005, two additional universities contracted with Ball State to conduct similar projects on their campuses. Positive feedback from both emphasized the transferability of the MAP concept to environments other than Ball State.

A Partnership to Develop MAP-Works
EBI MAP-Works: Since 1994, EBI MAP-Works, formerly Educational Benchmarking, has been dedicated to improving retention, student success, and the quality of the college student experience. EBI MAP-Works offers over 50 nationally-benchmarked academic and student affairs assessments which are rooted in accreditation and professional standards and in principles of continuous improvement. EBI MAP-Works’ retention effectiveness is grounded in theory, research and statistical methods. Through its national benchmarking assessments and MAP-Works, EBI MAP-Works has empowered more than 1,500 college and universities to impact student development, learning, retention and satisfaction. Essentially, EBI MAP-Works benchmarking assessments and MAP-Works are a proven foundation for effective assessment and student success initiatives.

EBI MAP-Works Partners with Ball State University: In 2005, EBI MAP-Works partnered with Ball State University to develop the next generation of MAP, named “MAP-Works.” This partnership brought a wealth of knowledge and experience from both parties. Ball State University brought 18 years of experience, research and knowledge regarding MAP. EBI MAP-Works brought 17 years of experience in assessment design, research, technical skills, and excellent customer support. EBI MAP-Works also brought the resources and expertise necessary to move the MAP-Works program to the web, so it could evolve into a full retention and student success platform that could be used by other colleges and universities. Most importantly, EBI MAP-Works and Ball State University shared a commitment to student retention and success.

Listed here are some of the many features and advances available in the current MAP-Works system:

- **Management Platform:** The transition to a web-based platform enabled instantaneous reporting of student information to faculty/staff so they could initiate needed interventions. The platform empowers faculty/staff to efficiently and effectively manage the intervention process through the use of colorful visualizations, dashboards, and easy search/sort functions. A web-based interface allowed the development of reports that were accurate and easy to use, increasing efficiency and enabling staff to spend less time on the computer and more time with students.

- **Academic Progress Evaluation:** MAP-Works provides an efficient process for capturing student grade performance, class attendance, and academic risk from faculty.

- **Faculty/Staff to Student Linkages:** Faculty and staff are linked to the students they are responsible for helping. This “Direct-Connect” relationship facilitates the efficient and effective sharing of information about the student on a “need-to-know” basis.

- **Referrals:** MAP-Works enables Direct-Connect faculty and staff to issue referrals for their students if a specific issue arises that would be better addressed by other direct-connects. MAP-Works also supports a campus-wide early alert system in which faculty and staff, even those not involved as a Direct-Connect, can issue referrals for students when an issue is identified.

- **Communication and Scheduling Capabilities:** MAP-Works facilitates opportunities to interact with students through an appointment scheduling function and communication options. The system also allows Direct-Connects to assign tasks to students and to track completion of those tasks.

- **Updated and Additional Surveys Options:** A review of the research literature was conducted to ensure that the new versions of the surveys reflect the best of the classic literature and current theoretical developments. Additional surveys (Fall Check-Up, Spring Transition, and Spring Check-Up) were added to capture changes in student experiences and expectations as well as collect information from students who enter mid-year.

- **MAP-Works for Upperclassmen:** Institutions now have the option to include their sophomores, juniors, and seniors to identify those struggling with choosing a major, meeting graduation requirements, choosing career paths, etc.

The partnership between EBI MAP-Works and Ball State University is an excellent example of how organizations with a common mission can collaborate to provide effective programs that positively impact the quality of education across the country.
Theoretical Foundation of MAP-Works

Research shows there are a number of important pieces to understanding a first-year student’s transition to college. These experiences include: initial social adjustment, initial academic adjustment, institutional commitment, educational goals, residence hall experiences, and study behaviors. During the revision of the MAP-Works First-Year Transition Survey, special attention was paid to research conducted by experts in the field of student retention, engagement, student development and success so their work would be mirrored in the survey items, as well as the structure of the MAP-Works platform. Below is some of the research and its relationship to MAP-Works:

- **Early Adjustment to College**: Upcraft, Gardner & Associates (1989) asserted that the success of first-year students is determined largely by pre-enrollment variables, institutional characteristics, and institutional climate. They emphasized the importance of peer interactions – “establishing close friends, especially during the first month of enrollment” (p.10) – and indicated “there is overwhelming evidence that students’ success is, in large part, determined by their experiences during the freshman year” (p. 12).

- **Astin’s Theory of Involvement**: Astin (Skipper, 2005) defined college student involvement (the investment of energy) and emphasized both the quantitative (amount of time on task) as well as the qualitative (type of effort made) nature of involvement. He also related involvement to both student learning and development. Astin stressed the importance of involvement and suggested that the effectiveness of educational experiences is “directly related to the capacity of that policy or practice to increase student involvement” (p. 519).

- **Student Development**: Chickering’s seven vectors describe stages of college student development (Chickering & Reisser, 1993). The vectors are (1) developing competence, (2) managing emotions, (3) moving through autonomy toward interdependence, (4) developing mature interpersonal relationships, (5) establishing identity, (6) developing purpose, and (7) developing integrity. Kegan (1982, 1994) took an integrative approach to development and suggested that an important development outcome is self-authorship. Using Kegan’s model, Baxter Magolda (2001, 2004, 2009) explored student development and the creation of internal identities.

- **Tinto’s Theory of Attrition**: Tinto’s (1993) classic theory describes the interaction between a student and the academic and social systems of a college environment. He emphasized the highly interdependent nature of those experiences and interactions as factors which affect a student’s commitment to the institution and educational goals. The theory flows through five main areas: pre-entry characteristics; goals and commitments; institutional experiences in both the academic systems and the social systems; integration (both academic and social); and the departure decision.
**Institutional Commitment (Revisions to Tinto’s Theory):** Bean and Eaton (2000) emphasized the importance of self-efficacy and the development of positive coping strategies, both of which can lead to better student outcomes. Braxton, Hirschy & McClendon (2004) emphasized the importance of initial institutional commitment for residential students because of its impact on student perceptions and behaviors (and thus retention). They also discussed the direct impact of pre-entry characteristics (i.e., self-efficacy) on retention/attrition decisions for non-residential students.

**Academic Self-Efficacy:** “Perceived self-efficacy refers to beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” (Bandura, 1997, p. 3). Self-efficacy has been linked to what situations people choose, the behaviors they display, their effort levels, their persistence, resiliency levels, thought patterns, and stress levels, as well as outcomes. Academic self-efficacy has been linked to academic performance.

**Socialization and Effort:** Pascarella’s model (1985) emphasizes the interaction with socializing agents (faculty and peers) and the quality of student effort as important predictors of student learning and development. Weidman’s model of undergraduate socialization (1989) discusses the normative contexts (e.g., residence halls), socialization processes (e.g., interactions, integration), and socialization outcomes.

**Student Expectations:** Pascarella & Terenzini noted that the transition to college can set the tone for what students expect, how much they get involved, and what they experience (Pascarella and Terenzini, 1992). Kuh, Gonyea and Williams (2005) described two ways in which student expectations impact experiences. First, expectations “serve as a filter, or a screening mechanism, through which students evaluate” their college experiences. (p. 35-36) Second, expectations can also serve “as a psychological catalyst or deterrent to certain types of behavior” (p.36). Miller, Bender, Schuh, & Associates (2005) discussed the need to promote reasonable expectations of college.

**Statistical Foundation of MAP-Works**

During the 15+ years that Ball State University administered the MAP survey on its own campus; various research studies were conducted to evaluate the value of the questions, the reliability of student responses, and the statistical validity of the data. Qualitative and quantitative studies were also conducted to gather both student and staff experiences with the data to establish its usefulness. Focus groups and follow-up surveys with staff verified that staff used the information in a variety of ways to support student success.
This section provides a discussion of the on-going statistical testing of the validity and reliability of the MAP-Works survey instruments, particularly the First-Year Fall Transition Survey.

**Survey Design:** The survey was designed by the survey development team at EBI MAP-Works and researchers at Ball State University. The First-Year Fall Transition Survey measures the behaviors and expectations of students entering a college or university. Survey questions are grouped into three types – categorical, numerical, and scaled. Categorical questions ask students to respond using categories, for instance, about their place of residence or the educational level of parents or guardians. Numeric questions ask students to provide numeric responses such as the number of hours spent studying during the past week. Perception questions ask students to use a scale to represent their responses. For instance, students are asked to assess their academic abilities. Perception questions use a 1 to 7 scale where “1” typically represents very dissatisfied or not at all, while “7” represents very satisfied or extremely.

In addition to the standard survey questions, participating institutions upload student profile data (e.g., entrance test scores, gender, race/ethnicity, etc.). Outcomes data (e.g., semester GPA, retention) are also provided by institutions. Institutions have the option to include a limited number of institution specific questions to customize the survey to their needs. They may also attach an unlimited amount of student profile items, chosen by the institution. For instance, institutions can add students’ majors, date of acceptance, or institutional indicators.

**Data Collection:** Data collection for the Fall Transition Survey begins typically three or four weeks into the fall term. Data collection occurs through EBI MAP-Works’ online surveying system. The institution submits a list of its students (first name, last name, and email address) and the system sends a UserID/Password encrypted unique link to each student. The survey system provides a variety of features including the ability to send reminder emails, as well as an “opt-out” function. Institutions have the ability to use either the MAP-Works portal or their own campus portal to link to the surveys. Similarly, the other three annual surveys (Fall Check-Up, Spring Transition, and Spring Check-Up) are administered using the online survey system, the MAP-Works portal, or a campus portal.

**Validity:** EBI MAP-Works and Ball State have conducted, and continue to conduct, empirical investigations to ensure the validity and reliability of MAP-Works in a variety of campus environments. The following tests have been used to verify validity:

- **Face Validity:** The term “face validity” refers to a determination of whether "on its face" a survey seems to measure what it purports to measure. This is purely a subjective judgment, often done by field experts. During the survey review process, the research team consults with published research and experts in the field to verify MAP-Works is measuring what is important and wording questions appropriately. In addition, a panel study of students was conducted at Ball State. Students were asked what they thought the questions meant, how and why they answered the way they did, and whether there was confusion on any of the items. These processes contribute to our confidence that the questions on this survey “appear reasonable,” and that there are no double meaning questions or questions that ask about more than one concept. EBI MAP-Works views “face validity” as necessary, but not sufficient, in and of itself.

- **Factor Development and Confirmation (Factor Analysis, Reliability Analysis, and Scale Reduction):** Factor analysis (exploratory and confirmatory) is used to validate the factor items.
  - **Reliability of Scales (Factors):** Cronbach’s Alpha, $\alpha$, are used to determine the reliability or internal consistency of our study factors or scales. Factors are the basis for the high-level analysis that EBI MAP-Works provides its clients. If a study’s factors are weak and unreliable, then little if any value can be given to descriptive or predictive analysis that is based on the factors. In general, $\alpha = 0.5$ is considered acceptable; $\alpha = 0.7$ is considered good; and $\alpha = 0.8$ is considered exceptional. The following list includes the factors from the Fall 2011 First-Year Transition survey and the corresponding Cronbach’s alphas:
## Factor (Scale Name) and Reliability (α)

<table>
<thead>
<tr>
<th>Factor (Scale Name)</th>
<th>Reliability (α)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment to the Institution</td>
<td>.77</td>
</tr>
<tr>
<td>Self-Assessment: Communication Skills</td>
<td>.75</td>
</tr>
<tr>
<td>Self-Assessment: Analytical Skills</td>
<td>.72</td>
</tr>
<tr>
<td>Self-Assessment: Self-Discipline</td>
<td>.80</td>
</tr>
<tr>
<td>Self-Assessment: Time Management</td>
<td>.77</td>
</tr>
<tr>
<td>Financial Means</td>
<td>.87</td>
</tr>
<tr>
<td>Basic Academic Behaviors</td>
<td>.67</td>
</tr>
<tr>
<td>Advanced Academic Behaviors</td>
<td>.79</td>
</tr>
<tr>
<td>Academic Self-Efficacy</td>
<td>.88</td>
</tr>
<tr>
<td>Peer Connections</td>
<td>.93</td>
</tr>
<tr>
<td>On-Campus Living: Social Aspects</td>
<td>.87</td>
</tr>
<tr>
<td>Homesickness: Separation</td>
<td>.62</td>
</tr>
<tr>
<td>Homesickness: Distressed</td>
<td>.87</td>
</tr>
<tr>
<td>Academic Integration</td>
<td>.86</td>
</tr>
<tr>
<td>Social Integration</td>
<td>.87</td>
</tr>
<tr>
<td>Satisfaction with Institution</td>
<td>.89</td>
</tr>
<tr>
<td>On-Campus Living: Environment</td>
<td>.76</td>
</tr>
<tr>
<td>On-Campus Living: Roommate Relationship</td>
<td>.82</td>
</tr>
<tr>
<td>Off-Campus Living: Environment</td>
<td>.77</td>
</tr>
</tbody>
</table>

### Statistical Tests Used

- Factor analyses, both exploratory and confirmatory, are conducted to determine statistical groupings of questions.
- Cronbach’s alpha reliability scores are calculated for each of the scales for each campus, as well as the whole population to ensure the internal consistency of the scales in specific campus environments and across campus environments.
- Standard exploratory statistics (e.g., descriptive statistics, various plots and graphs, etc.) are also examined to check the scales for unusual response patterns.

### Convergent and Divergent Predictive Validity of Factors

- **Convergent (Predictive) Validity:** One test for construct validity is “convergent validity” or, as it is sometimes referred to, “predictive validity.” Items with predictive validity are those that have relationships suggested by theory. In other words, if a predicted relationship is found, that relationship provides evidence for the validity of the factors. In MAP-Works, constructs are evaluated both in relationship to each other and in relationship to several outcome measures, such as retention and GPA. For example, high correlations between factors such as Social Integration and Peer Connections support the validity of each scale because theory says peer relationships should relate to integration in the social systems of a campus. Similarly, the relationships between Satisfaction with the Institution, Academic Integration, Social Integration, and Commitment to the Institution and persistence not only validate the usefulness of the scales, these results mirror results published by other studies.

- **Divergent (Discriminant) Validity:** Another test of construct validity is “divergent” or “discriminant” validity. Here the degree to which a construct is dissimilar to (diverges from) other constructs is examined, with particular attention paid to items that theory suggests should be dissimilar. In MAP-
Works, there is evidence of divergent validity. For instance, the differences between the two Homesickness factors (Homesickness: Separation and Homesickness: Distressed) are seen not only in the factor analysis, but also in the different relationships each factor has with persistence and GPA. These differences support the validity of two separate constructs.

- **Statistical Tests Used**
  - Correlational analysis and cross-tabulations with Chi-Square analysis are used to investigate and confirm the predicted relationships among the constructs. For example, Social Integration and the Social Aspects of On-Campus Living are significantly correlated.
  - Regression models (linear and logistic) and classification tree methods (e.g., CHAID - chi-squared automatic iteration detection; C&RT – classification and regression trees; and QUEST – quick, unbiased, efficient, statistical tree) are used to validate the predictive validity of the factors and their relationships.

- **Other Testing**
  - Descriptive Analysis (Frequencies, Means, Standard Deviations)
  - Correlations and Regression Models (Linear & Logistic) with Profile, Factors, and Outcomes
  - Decision Trees (C&RT, CHAID) and Path Models
  - Theme Coding of Open-Ended Responses

These analyses are on-going, meaning that they will be continued as further data from more campuses and more years become available.

**Development of the MAP-Works Risk Indicator**

One of the missions of MAP-Works is to identify students who are at-risk either for leaving the institution or poor performance academically. While at Ball State University, Dr. Sherry Woosley began the statistical analyses which provide the foundation for the MAP-Works risk indicator. Dr. Woosley has continued her work by moving to EBI MAP-Works and heading up the EBI MAP-Works research team. The team continues to conduct statistical analyses to determine algorithms that can identify and predict which students may be at risk. These analyses have confirmed that not only are many of the MAP-Works variables correlated with each other (as predicted by Tinto’s discussion of the interdependent nature of experiences), they also consistently correlate with outcomes such as academic performance, persistence, and retention. Further, additional analyses demonstrate that these factors are also significant predictors of outcomes (predictive validity). On the other hand, a number of topics (e.g., reasons for choosing the college, life goals, etc.) have been found to be interesting but not very useful in understanding students’ transition experiences or in predicting student outcomes.

MAP-Works uses the algorithms provided by the analyses to classify each student into one of four categories (Green, Yellow, Red, and Red2). Not only is each MAP-Works student assigned a Risk Indicator group, the Risk Indicator is dynamic in that it changes as more current information is received about a student. Thus, a student can move from one group to another as the year progresses. The Risk Indicator includes student characteristics provided by the institution (e.g., entrance test scores, cumulative GPA), survey responses from any of the four surveys the student has completed, as well as input from faculty. Risk Indicators are available for both survey responders and non-responders, provided that non-responders have information from other sources, such as the institution or faculty.

The Risk Indicator is determined by sophisticated algorithms based on the outcomes of the institutions participating in the previous year’s MAP-Works project. The development process is extensive and utilizes a variety of statistical analyses including logistic and linear regression models, C&RT analyses, CHAID analyses, path models, and simulation models. Beginning in fall 2010, EBI MAP-Works moved from a single algorithm to a series of customized algorithms for
various campus contexts. As part of that process, continuing institutions that provide outcome data are custom fit with the algorithm that best matches their students and their outcomes. Although the exact algorithms are proprietary, they include the variables that consistently offer the best predictive power for identifying students who leave an institution or have academic difficulties.

References
Below is an alphabetical list of the references used in this paper and in the development of MAP-Works.


