



**MAP-Works<sup>®</sup>**  
Making Achievement Possible

## 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 system, in addition to the statistical foundations of the work. It also contains a brief history of the MAP-Works system.

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# MAP-Works®

Making Achievement Possible

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## What is MAP-Works?

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MAP-Works® is a research-based, comprehensive, student retention and success system created through a partnership between EBI MAP-Works and Ball State University. It 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 leverages predictive analytics to identify at-risk students. It presents that information in a format that makes it easy for an institution's faculty and administrators to focus on the needs of students early in the term and to have a positive impact on student success and retention.

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 target relevant issues -- maximizing the effectiveness of time spent helping students.
- Continuously evaluate the at-risk status of students 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 mobile/tablet apps to facilitate the communication and delivery of information.
- Refer at-risk students to faculty and staff members who have the programs and resources to help them.
- Coordinate efforts among faculty and staff members who are responsible for reaching out to at-risk students, through the use of notes and referrals.
- Engage students through personalized feedback and features that are used to assign tasks.
- Analyze aggregate data regarding student experiences and benchmark results against peer institutions.
- Generate customized reports to support campus initiatives; make informed decisions related to 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 that impact their social and academic success.
- Seek out and utilize the institution resources that can help them.

## The Inspiration for MAP-Works

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The first year of college sets the tone for what students expect in terms of their level of involvement and their overall experience (Pascarella & Terenzini, 1992). As a result, institutions have developed a wide variety of 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 in

### ***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

Reference: Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition. (2nd ed).* Chicago: University of Chicago Press.

the student's 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 ample opportunities for the interventions and interactions that facilitate student learning.

## Making Achievement Possible (MAP)

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**Origins of the MAP program:** In early 1988, Ball State University initiated a collaborative survey project to gather and provide quality information about students, and to share responsibility for student success. The project was entitled Making Achievement Possible (MAP) because its primary goal was to help make student achievement possible by focusing on early interventions.

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, did not anticipate roommate or social adjustment issues, or did not fully comprehend the level of effort that would be required 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 identifying 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. Existing methods also 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 to create new initiatives that would help students succeed.

With those concerns in mind, they set the following goals:

- 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

In order to achieve these goals, a development committee was established, comprised of 15 faculty and staff members from Academic Assessment and Institutional Research, Housing and Residence Life, and University College (both Academic Advising and the Learning Center). The first version of the MAP program 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, and local expertise. After several iterations, a standard for the program evolved. The administration of MAP took place during the third or fourth week of classes, and the survey instrument was comprised of 160 items. Reports of the results were sent to individual students, their residence hall staff, and their academic advisors.

In 1999, Sherry Woosley, Ph.D. was hired as the Project Director of MAP in Ball State's Office of Academic Assessment and Institutional Research. From 1999 to 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, designed to explore student, faculty, and staff perspectives. Based on that information, her team made key modifications to the reporting components of the program. Dr. Woosley leveraged her work to make campus improvements and published her work, discussing 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

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In 2005, EBI MAP-Works partnered with Ball State University to develop the next generation of MAP, “MAP-Works.” Ball State University brought 18 years of experience, research and knowledge, based upon its experience with the MAP initiative. EBI MAP-Works contributed 17 years of experience in assessment design, research, technical skills, and personalized customer support. Leveraging the resources and expertise of the EBI MAP-Works development team, the combined team knew that it could quickly develop a web-based version of the MAP-Works program, creating a full retention and student success system 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 available in the current MAP-Works system:

- **Web-Based System:** The transition to a web-based system enabled instantaneous reporting of student information to faculty/staff so they could initiate needed interventions. The MAP-Works system empowers faculty/staff to efficiently and effectively manage the intervention process through the use of colorful visualizations, dashboards, and easy search/sort functions. An intuitive interface provides quick access to clear, concise reports, enabling staff and faculty members to spend less time identifying issues and more time with students.
- **Academic Progress Evaluation:** MAP-Works provides an efficient process for capturing information from faculty members, including student grade performance, class attendance, and academic risk.
- **Faculty/Staff to Student Linkages:** Faculty and staff are linked to the students they are responsible for helping, through the Direct-Connect feature in MAP-Works. These relationships facilitate the efficient and effective sharing of information about students on a “need-to-know” basis.
- **Referrals:** MAP-Works enables Direct-Connect faculty and staff to issue referrals for their students when a specific issue arises that would be better addressed by other faculty or staff members with Direct-Connect relationships. MAP-Works also supports a campus-wide early alert system in which faculty and staff, even those not assigned as Direct-Connects, 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:** MAP-Works surveys are continually updated to incorporate the best of the classic literature and current theoretical developments, based on ongoing reviews of the research literature related to student success and retention. Additional surveys (Fall Check-Up, Spring Transition, and Spring Check-Up) have been added to capture changes in student experiences and expectations, as well as to collect information from students who enter the institution mid-year.
- **MAP-Works for Upperclassmen:** Institutions now have the option to include their sophomores, juniors, and seniors, enabling them to identify those struggling with choosing a major, meeting graduation requirements, choosing career paths, and other issues.

The partnership between EBI MAP-Works and Ball State University is an excellent example of how organizations with a shared mission can effectively collaborate on programs that positively impact the quality of education.

## Theoretical Foundation of MAP-Works

Research indicates that there are a number of important personal and institutional characteristics and experiences that impact a first-year student's transition to college, including 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 student success, to incorporate their work into both the survey items and the structure of the MAP-Works system. Below is a summary 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 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, and 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

*MAP-Works focuses on the early adjustment of first-year students and emphasizes both academic and socio-emotional adjustment.*

*MAP-Works focuses on the quantity and quality of involvement in a variety of domains including academic, social, co-curricular, residence life, etc.*

*MAP-Works includes items about self-perceptions of skills, initial social relationships, and educational goals. Feedback to students emphasizes personal responsibility and development, and building connections for long-term success.*

*MAP-Works not only asks about every area in Tinto’s theory, the reporting is structured around some of these concepts.*

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.

*MAP-Works asks about institutional commitment, as well as degree commitment. A student's intent to leave is a component of a MAP-Works report.*

- **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 a person's choice of situations, behaviors, effort levels, persistence and resiliency, thought patterns, stress levels, and outcomes. Academic self-efficacy has been linked to academic performance.

*MAP-Works focuses on academic self-efficacy and encourages students to build self-efficacy by promoting self-reflection and successful behaviors.*

- **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.

*MAP-Works addresses a variety of domains that are part of socialization, including both academic and social environments.*

- **Student Expectations:** Pascarella & Terenzini noted that the transition to college can set the tone for what students expect, the extent to which they get involved, and what they experience (Pascarella and Terenzini, 1992). Kuh, Gonyea and Williams (2005) described two ways in which a student's 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.

*One of the original goals of MAP-Works was to address unrealistic student expectations. MAP-Works not only asks students to reflect on their expectations; it also provides students with individualized feedback and social norming information to influence their actions.*

## Statistical Foundation of MAP-Works

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During the 15+ years that Ball State University administered the MAP survey on its own campus, staff members conducted various research studies to evaluate the value of the questions, the reliability of student responses, and the statistical validity of the data. Qualitative and quantitative studies were used 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 wide 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 jointly 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 number of student profile items, chosen by the institution. For example, institutions can add a student’s majors, date of acceptance, or institutional indicators.

**Data Collection:** Data collection for the Fall Transition Survey typically begins three or four weeks into the fall term, facilitated by 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 unique User ID/Password-encrypted 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 continues 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 a purely subjective judgment, often made by field experts. During the survey review process, the research team consults with published research and experts in the field to verify that MAP-Works is measuring the most important attributes and attitudes and is wording questions appropriately. As part of the original product design process, the research and product teams conducted a panel study of students at Ball State University. 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 ongoing efforts bolster our confidence that the questions on the MAP-Works survey are “reasonable,” and that it is free of both ambiguous questions and questions that ask about multiple concepts. 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.
  - **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.

Factor (Scale Name)	Reliability ( $\alpha$ )
Commitment to the Institution	.79
Self-Assessment: Communication Skills	.75
Self-Assessment: Analytical Skills	.70
Self-Assessment: Self-Discipline	.79
Self-Assessment: Time Management	.77
Financial Means	.88
Basic Academic Behaviors	.69
Advanced Academic Behaviors	.80
Academic Self-Efficacy	.86
Peer Connections	.93
On-Campus Living: Social Aspects	.86
Homesickness: Separation	.63
Homesickness: Distressed	.86
Academic Integration	.87
Social Integration	.90
Satisfaction with Institution	.89
On-Campus Living: Environment	.73
On-Campus Living: Roommate Relationship	.81
Off-Campus Living: Environment	.75
Test Anxiety	.88

- **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 to its clients. If a study’s factors are weak and unreliable, then little, if any, value can be derived from descriptive or predictive analysis that is based on the factors. The list above includes the factors from the Fall 2012 First-Year Transition survey and the corresponding Cronbach’s alpha scores.
- **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 indicates that 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, Commitment to the Institution, and persistence not only validate the usefulness of the scales; these results also 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 that 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. They will be continued indefinitely, as new data from additional campuses and years become available.

## Development of the MAP-Works Risk Indicator

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One of the goals of EBI MAP-Works is to leverage predictive analytics to identify students who are at-risk, either for leaving the institution or for poor academic performance. While at Ball State University, Dr. Sherry Woosley began the statistical analyses that provide the foundation for the MAP-Works risk indicator. Dr. Woosley has continued her work by joining EBI MAP-Works and leading the EBI MAP-Works Analytics and Research Team. The team continues to conduct statistical analyses to develop algorithms that can be used to identify students who may be at risk and to assign specific levels of risk to each student. These analyses have confirmed that many of the MAP-Works variables are 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. 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 useful in terms of understanding students’ transition experiences or in predicting student outcomes.

MAP-Works applies 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 additional, updated 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, assuming that faculty or staff members have entered information about the non-responders.

The Risk Indicator is determined by sophisticated algorithms, based on student success outcomes of the institutions that participated 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 the fall of 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 to EBI MAP-Works 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 provide the best predictive power for identifying students who leave an institution or have academic difficulties.

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