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# The Construction and Validation of an Instructor Learning Analytics Implementation Model to Support At-Risk Students

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The Construction and Validation of an Instructor Learning Analytics  
Implementation Model to Support At-Risk Students

by

Holly McKee

A dissertation report submitted in fulfillment of the requirements  
for the degree of Doctor of Philosophy  
in  
Information Systems

College of Engineering and Computing  
Nova Southeastern University

2016

We hereby certify that this dissertation, submitted by Holly McKee, conforms to acceptable standards and is fully adequate in scope and quality to fulfill the dissertation requirements for the degree of Doctor of Philosophy.

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2016

An Abstract of a Dissertation Report Submitted in Fulfillment of the Requirements for  
the Degree of Doctor of Philosophy in Information Systems

The Construction and Validation of an Instructor Learning Analytics  
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by  
Holly McKee  
November 2016

With the widespread use of learning analytics tools, there is a need to explore how these technologies can be used to enhance teaching and learning. Little research has been conducted on what human processes are necessary to facilitate meaningful adoption of learning analytics. The research problem is that there is a lack of evidence-based guidance on how instructors can effectively implement learning analytics to support academically at-risk students with the purpose of improving learning outcomes. The goal was to develop and validate a model to guide instructors in the implementation of learning analytics tools to support academically at-risk students with the purpose of improving learning outcomes. Using design and development research methods, an implementation model was constructed and validated internally. Themes emerged falling into the categories of adoption and caution with six themes falling under adoption including: LA as evidence, reaching out, frequency, early identification/intervention, self-reflection, and align LA with pedagogical intent and three themes falling under the category of caution including: skepticism, fear of overdependence, and question of usefulness. The model should enhance instructors' use of learning analytics by enabling them to better take advantage of available technologies to support teaching and learning in online and blended learning environments. Researchers can further validate the model by studying its usability (i.e., usefulness, effectiveness, efficiency, and learnability), as well as, how instructors' use of this model to implement learning analytics in their courses affects retention, persistence, and performance.

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To my husband, Mitch: you have never allowed me to believe there is anything I can't do. You pushed me to do this and didn't allow me to consider that not doing it was an option. Thank you. I love you. Last, to my Riley Dene: this is for you darling girl. There is nothing in this world you can't accomplish, and being your mama is my greatest accomplishment.

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## Chapter 1

### Introduction

#### **Background**

Learning analytics (LA) is the collection, analysis, and reporting of available data to improve the teaching and learning process and environment. LA is rooted in the concepts of business intelligence. Businesses have long been collecting data on customers to gain insight and improve outcomes. Academic organizations have more recently started to put these principles into practice by collecting data about students, courses, and enrollment, for example (Siemens & Long, 2011).

There are two main categories of research in the field of LA. The first is on how to capture, process, and present data to educational stakeholders in useful ways. The second, and less common, focus of research is on how to take up and use analytics in practice to inform choices or prompt action (Wise, Vytasek, Hausknecht, & Zhao, 2016). More simply, the majority of research has focused on how to create useful information from large quantities of collected data (Dawson, Gasevic, Siemens, & Joksimovic, 2014). Less research has been conducted on how to actually put this information to use to achieve desired purposes in the educational environment (Ferguson et al., 2014; Lockyer, Heathcote, & Dawson, 2015; West, Heath, & Huijser, 2016; Wise, 2014; Wise et al., 2016). LA holds potential application for a range of stakeholders in higher education including instructors, researchers, curriculum developers, learning environment designers, and university policy makers. LA is utilized at many levels within academic institutions, but a common application is at the course level (Dziuban, Moskal, Cavanagh,

& Watts, 2012). Data within the learning management system (LMS) regarding student activity can be tracked and analyzed to monitor student progress, predict student success or failure, or inform instructional design. At this course level, a common use of LA is to identify and support academically at-risk students (Agnihotri & Ott, 2014; Harrison, Villano, Lynch, & Chen, 2015; Jayaprakash & Lauría, 2014). At-risk students are those likely to fail or drop the course. Once these students are identified (i.e., information is created), instructors must use this information to guide, encourage, or support the student (i.e., analytics are used in practice). LA at the course level is an important area of research that promises to improve learning outcomes in online and blended courses by providing rich information regarding participation and performance to instructors and students alike.

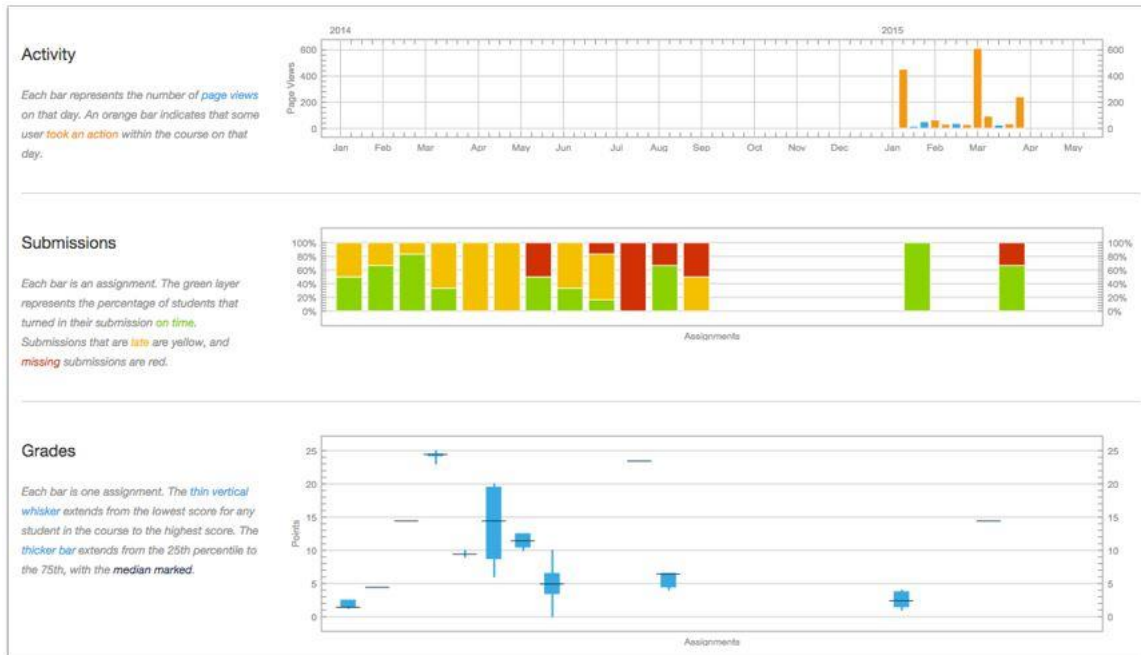
Much of the literature in the second category of LA research uses the term “intervention” to describe the act of taking up and using analytics in practice (Lockyer et al., 2015; Wise, 2014; Zacharis, 2015). Interventions are often the student being presented with information generated by the analytics in some way. For example, Hu, Lo, and Shih (2014) developed a tool that would send at-risk students a “fail the course alert”. Interventions in and of themselves do not necessarily improve the student’s academic standing, but afford the student with an opportunity to more effectively monitor their learning in order to achieve their desired outcome (Roll & Winne, 2015). Wise et al. (2016) pointed out that this term can be useful, but can also include the undesired connotation that LA use is an interruption in the regular teaching and learning process. Instead, they chose to use the term “LA implementation” to describe the use of LA as an ongoing part of the regular monitoring and responsive adjustment to teaching and

learning practices. This study also uses the term “LA implementation” to describe the process of taking up and using analytics in practice.

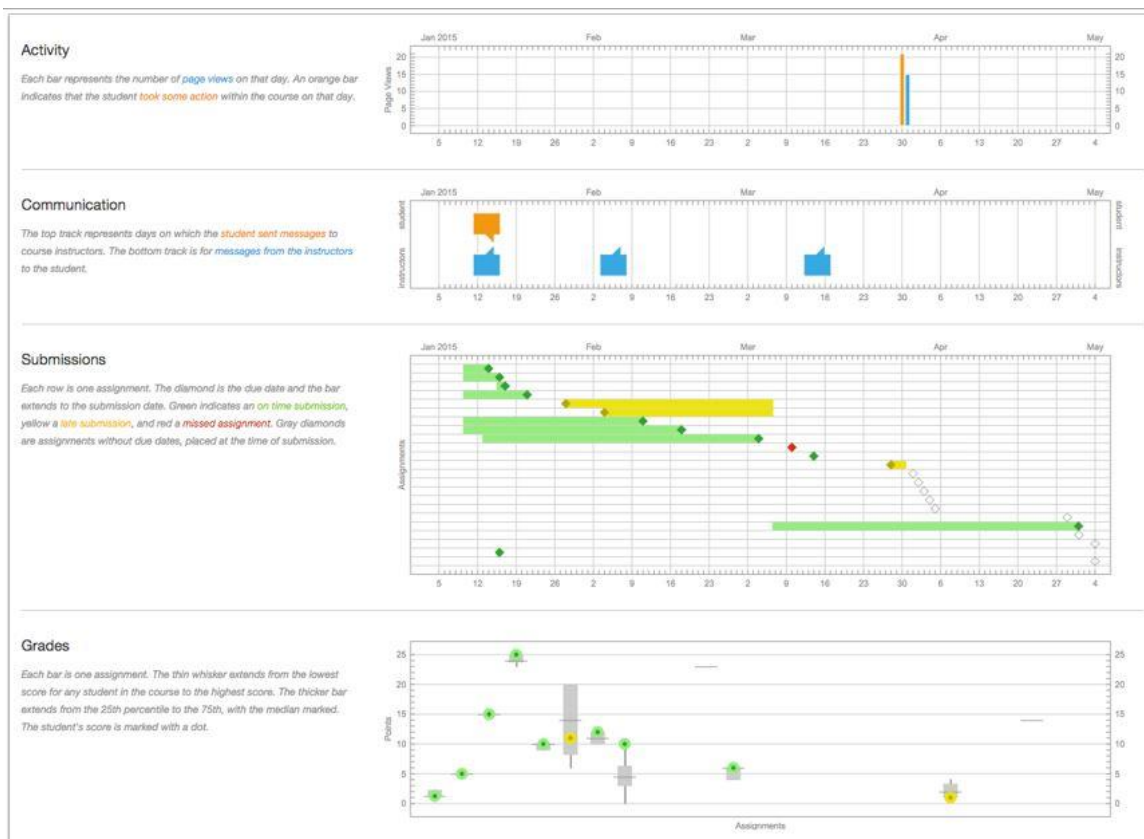
This study focused on the use of LA at Southwestern Oklahoma State University (SWOSU). SWOSU is a regional university in western Oklahoma with approximately 5,000 undergraduate, graduate, and professional students enrolled and approximately 225 faculty members employed. SWOSU currently provides faculty with two LA tool options. All faculty have access to Canvas Analytics as part of the Canvas LMS. SWOSU is also piloting AspirEdu’s Dropout Detective in two of its fully online programs including RN to BSN and Health Information Management (HIM). Both of these tools are designed for instructor use. The RN to BSN program has approximately 300 students enrolled and 12 faculty members. The HIM program has approximately 75 students enrolled and four faculty members. These faculty are motivated to use Dropout Detective because they volunteered for the pilot program and given they teach in a fully online program, these faculty also seek ways to engage and monitor their remote students. Canvas Analytics is a part of the LMS. Use of this tool depends on individual motivation or interest.

Canvas Analytics includes course analytic reports which provides information regarding course activity, submissions, and grades (Figure 1). Student analytic reports which provides information regarding individual student activity, communication, submissions, and grades (Figure 2). Course analytic reports provide a broader view of what is happening within the course. Activity is shown according to page views and student action over the course of the semester. The submissions section shows each assignment with on time, late, and missing percentages. The grades section displays

lowest and highest scores as well as percentiles for each assignment. The course analytics report also shows a summary of individual student page views, participations, submissions, and current score (Figure 3). Student analytics provides a separate report for each student in the course. This report shows individual student activity, communication, submissions, and grades throughout the semester.



**Figure 1.** Canvas Course Analytics Report



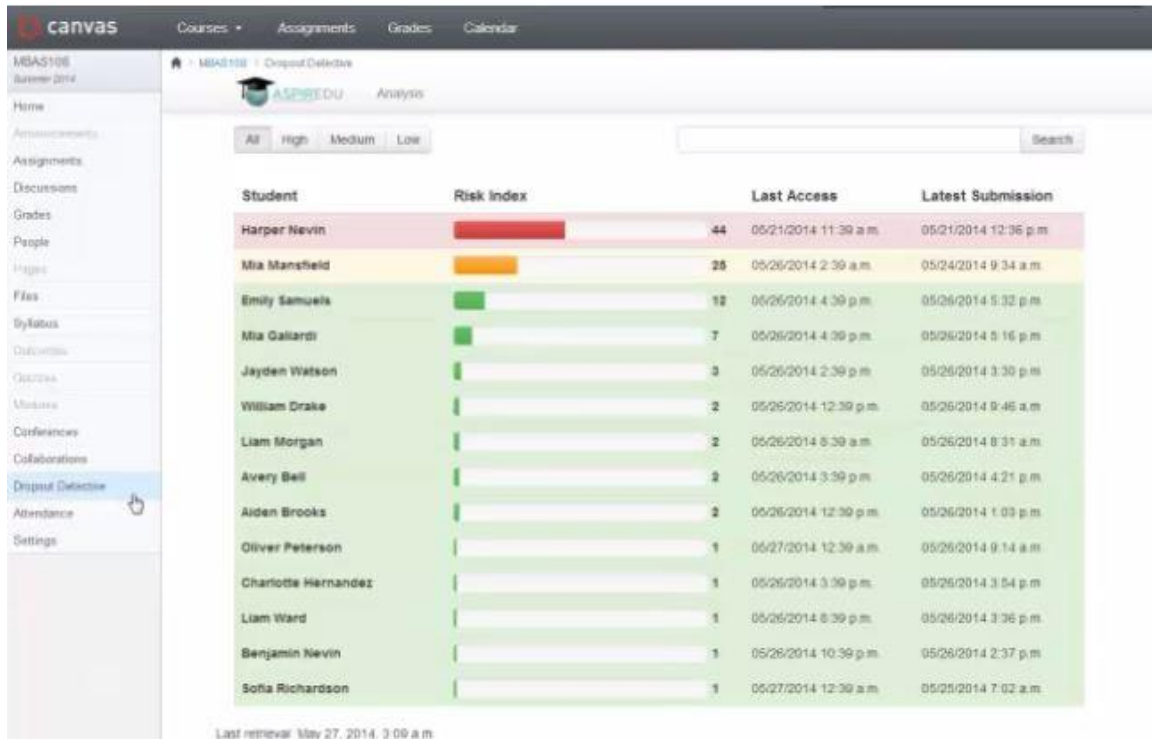
**Figure 2.** Canvas Student Analytics Report

Student ▾	Page Views ◊	Participations ◊	Submissions	Current Score ◊
				58.25%
				87.78%
				91.71%
				70.79%

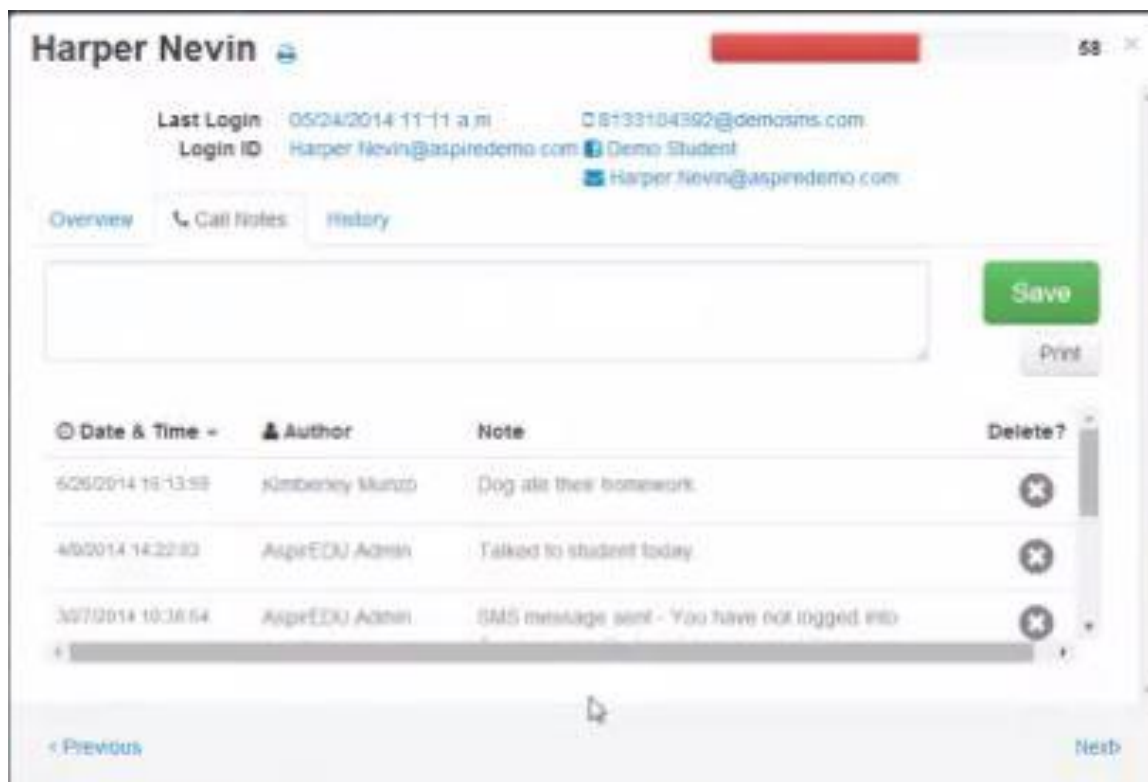
**Figure 3.** Canvas Student Analytics Summary Report

Dropout Detective is a student retention and success solution that integrates directly with Canvas LMS to provide a “risk index” of how likely it is that each student will drop out of or fail their course(s). The tool analyzes past and current behavior to predict future performance. Dropout Detective aggregates different measures of student risk (last login, grade, missing assignments, last access, and latest submission) and publishes a dashboard with red, yellow, and green risk ratings (Figure 4). This dashboard

enables the instructor to view students' progress and determine appropriate intervention strategies such as contacting the student through email or phone if necessary. Dropout Detective's Call Notes feature also provides a place for advisors and instructors to note student contact (Figure 5). Instructors can also opt to allow the tool to send automated text and email messages to students based on LMS data.



**Figure 4.** Dropout Detective Analytics Report



**Figure 5.** Dropout Detective Call Notes Feature

### **Problem Statement**

While LA tools may show that students who regularly log into an LMS perform better than their less active peers, this information alone changes nothing and does not mean the instructor will provide a suitable response (Roll & Winne, 2015). Furthermore, simply telling the student to log into the LMS more often will not be helpful (Dawson et al., 2014). While analytics tools may provide insight, they do not help instructors to provide a systematic and integrated response to such situations that will result in better outcomes for the at-risk student. As Wise (2014) stated, “without a plan for shifting patterns of teaching and learning activity, new technologies often remain ancillary to the teaching and learning process, either used tangentially to marginally enhance existing practices or often simply collecting dust on the virtual shelf” (p. 203). Little research has



been done on what human processes are necessary to facilitate meaningful implementation of LA. Research is needed on how to meaningfully convey analytics to learners (Roll & Winne, 2015).

There is a general lack of research-based guidance on how various stakeholders (i.e., learners, instructors, and administrators) can effectively use LA tools, but researchers have begun to address this in recent years. West et al. (2016) presented a framework for institutional implementation of LA to support student retention efforts. Wise et al. (2016) addressed the problem of how students can take up and use LA in practice, but many LA tools (such as Dropout Detective and Canvas Analytics) are designed for instructor use and students cannot access the information they generate. Mor, Ferguson, and Wasson (2015) focused on how instructors can use LA to inform their reflective practice and learning design, but very few studies have actually focused on how instructors can use analytics in practice to support the student learning process. A few studies have addressed this issue in part, but focused on specific topics such as instructors using LA to facilitate student discussions (van Leeuwen, Janssen, Erkens, & Brekelmans, 2014), instructors using analytics to support students working in groups (van Leeuwen, Janssen, Erkens, & Brekelmans, 2015), or how learning design can inform instructor use of LA (Lockyer et al., 2015). There is a need for a model to support instructor-specific use of LA to encourage its systematic use as an integrated part of the teaching process. The research problem is that there is a lack of evidence-based guidance on how instructors can effectively implement LA in their courses to support at-risk students.

## **Dissertation Goal**

The goal of this design and development study was to develop and validate a model to guide instructors in the implementation of LA tools to support academically at-risk students with the purpose of improving learning outcomes. At-risk students are those likely to fail or drop the course. They are identified through the use of LA tools which report student performance. Learning outcomes is defined as persistence and course grade. The use of the term “model” is based on taxonomy presented by Nilson (2015) that distinguishes between the different categories of theories models and frameworks in implementation science. The proposed model would be classified as an action model. It is based on the existing research literature in LA as well as input from various stakeholders (instructors, online learning administration, and online learning committee members) gathered through a needs assessment. The model includes generalizable principles as well as more specific recommendations to guide instructor use of LA tools. The model was validated internally by obtaining input from various stakeholders such as instructors, online learning administration, and online learning committee members. Richey and Klein (2007) pointed out that without validation research, the primary evidence of the effectiveness of models is user testimonials which are unreliable. Internal validation focuses on the integrity of a model and its use, while external validation documents the impact of the model’s use. External validation is out of the scope of this study.

## **Research Questions**

The following research questions guided the study:

1. What LA tools and models are currently available to instructors, how are they using these tools and models to support teaching and learning, and what are the benefits and limitations of such LA tools and models? This research question was

addressed by performing a literature review to identify relevant information to inform the preliminary model design.

2. What needs to be considered to design an effective model to guide instructors in LA implementation to support at-risk students? This research question was addressed through a needs assessment to identify stakeholder needs. Stakeholders include instructors, online learning administration, and online learning committee members.
3. How can stakeholder needs inform the design of such a model? Both the literature review and needs assessment were used to develop an LA model to guide instructors in the development of interventions for at-risk students.
4. How do instructors perceive the effectiveness and efficiency of the proposed LA model? Input regarding design, content, and use of the LA model was gathered from stakeholders using a Delphi panel to validate the model.
5. What modifications are needed to improve the proposed LA model? Feedback from the Delphi panel was used to modify and validate the model.

### **Relevance and Significance**

Much of the literature on LA has focused on how to create, process, and present data to educational stakeholders, but little research has been done on how to effectively utilize analytics tools in practice. The information provided by LA does no good if LA is not effectively implemented by instructors or institutions as a whole. It is important that higher education institutions not only buy in to these products and provide them to faculty, but take a systematic organization-wide approach to their implementation (Dawson et al., 2014). Instructors must not only be equipped with LA tools, but must be

provided with a meaningful and systematic implementation strategy. Only then will LA tools begin to increase student retention and success in the classroom.

There is a need for more research in the area of LA model construction and validation to guide and inform the use of LA by students, instructors, administrators, and various stakeholders. Specifically, there is a gap in LA research literature when it comes to providing meaningful guidance to instructors on the effective use of LA. This study was an initial step in the area of LA model research by providing a validated model to guide instructors in the adoption and effective use of LA tools to support at-risk students. This study also contributes to the field of design and development research by providing an example of a construction and internal validation study utilizing a number of qualitative research methods.

### **Barriers and Issues**

Cooperation between the researcher and the university where surveys were administered and focus groups were conducted, Southwestern Oklahoma State University (SWOSU), was paramount. The study was approved by SWOSU, and stakeholders within the university were supportive of the researcher's goals and methods. Participants consisted of SWOSU faculty who have LA tools available to them. These instructors were willing to provide meaningful and honest feedback during the needs assessment and Delphi panel stages. The positive relationship between the researcher and these participants helped the study to go smoothly with no major barriers or issues encountered.

Participants were a convenience sample from within the university, and available university technology resources were used. The development and validation of this model were based on its application to the use of the specific LA tools available at SWOSU. The participants' use of these tools and feedback regarding such use served as a user-case

that combined with other inputs provided a basis to develop generalized guidelines.

While the participants and target audience use specific LA tools, the aim was not to develop a model to support the use of one or both of these tools specifically, but any tool similar to these that can be used to help at-risk students. The goal was for this model to be generalizable to a number of LA tools and environments.

### **Assumptions, Limitations, and Delimitations**

It was assumed that: participating faculty at SWOSU utilize the LA tools available; faculty using Dropout Detective are motivated to do so because they teach in online programs and seek ways to engage and monitor their remote students; the use of Canvas Analytics is driven mainly by personal motivation or interest in LA. It was also assumed that the feedback regarding the use specific tools can effectively guide the development of a model that will be generalizable to a number of LA tools and environments. The use of a convenience sample of faculty using specific LA tools was a limitation. Delimitations included the fact that participation was not sought outside of SWOSU faculty. Participants within SWOSU who have experience with available tools (and possible prior experience with others) represented a meaningful group. Data collection took place during spring 2015 semester. It is assumed that further extended data collection would not have been beneficial.

### **Definitions of Terms**

**Learning Analytics** – “The measurement, collection, analysis and reporting of data about learners and their contexts, for the purposes of understanding and optimizing learning and the environments in which it occurs” (Siemens & Long, 2011, p. 34).

**At-Risk Students** – For the purposes of this study, “at-risk students” is defined as those likely to fail or drop the course.

**Learning Outcomes** – For the purposes of this study, “learning outcomes” is defined as persistence and course grade.

**Learning Analytics Implementation** – The use of LA as an ongoing part of the regular monitoring and responsive adjustment to teaching and learning practices (Wise et al., 2016).

**Design and Development Research** – The systematic study of design, development and evaluation processes with the aim of establishing an empirical basis for the creation of instructional and non-instructional products and tools and new or enhanced models that govern their development (Richey & Klein, 2007).

**Process Model** – a theoretical approach with the aim of describing and/or guiding the process of translating research into practice (Nilson, 2015).

**Action Model** – a type of process model that provides practical guidance in the planning and execution of implementation endeavors and/or implementation strategies to facilitate implementation. Note that the term “model” and “framework” are both used, but the former appears to be the most common (Nilson, 2015).

### **List of Acronyms**

LA – learning analytics

LMS – learning management system

SWOSU – Southwestern Oklahoma State University

HIM – Health Information Management

RN to BSN – Registered Nurse to Bachelors of Science in Nursing

CETL – Center for Excellence in Teaching and Learning

ETLC – Excellence in Teaching and Learning Committee

### **Summary**

This chapter identified the problem related to the lack of evidence-based guidance on how instructors can effectively implement LA to support at-risk students. Background related to LA literature and the context of the study was presented. The goal of developing and validating a model to guide instructors in the implementation of LA tools to support academically at-risk students was presented along with research questions, relevance and significance, barriers and issues, and limitations and delimitations. Terms were defined and a list of acronyms was also provided. This study contributes to the body of knowledge regarding implementation of LA in the classroom as opposed to the development of LA tools.

The following chapters are organized as follows: Chapter two provides a thorough review of literature related to LA tools, models, and implementation, as well as literature related to design and development research. Chapter three provides an overview of the research methodology, specific research methods, instrument development and validation, sample, and methods of data collection, analysis, and presentation of results. Chapter four presents the results of the study. Chapter five presents conclusions, implications, and a summary of the study.

## Chapter 2

### Review of the Literature

The distinction made by Wise et al. (2016) between learning analytics (LA) research on data capture, processing, and presentation and research on using analytics in practice to inform decision making and action is similar to a distinction made by Richey and Klein (2007). In Richey and Klein's (2007) discussion of the types of design and development research guiding the instructional design process, they differentiate between product and tool research and model research. Product and tool research involves a detailed description, analysis, and evaluation of the design and development of specific products to understand conditions, which facilitate their use. In contrast, model research is the study of model development, validation, or use, which results in new procedures or models and conditions, which facilitate their use. The difference is that product and tool research results in context-specific conclusions while model research promises results and conclusions which are more generalizable to the entire field. Essentially, the first category of LA research focuses on the development of tools, and the second category focuses on developing models or frameworks which will facilitate the use of such tools. The majority of past research on the topic of LA focuses on tool development; however, frameworks and models that guide users in making decisions about what to do with the LA data are few (Wise, 2014). A major weakness in the field of LA research is that the focus is on reporting rather than decision-making (Papamitsiou & Economides, 2014).

A review of the literature guided the identification of what LA tools and models are currently available to instructors, how they are being used, and the benefits and



limitations of such tools and models. This review informed the design and development of a preliminary model to guide instructor use of LA. The following review of literature includes a brief overview of the current state of the body of knowledge in the LA field regarding data capture, processing, and display as well as LA implementation. In addition, a review of studies utilizing a design and development research strategy that guided the methodology development is included.

### **Learning Analytics Tools**

The majority of research in the LA field has been on the development and validation of LA tools to support student performance tracking. Dawson et al. (2014) pointed out that the bulk of research prior to the writing of their paper was based on the extraction and analysis of readily available data from the learning management system (LMS) and identification of the variables that inform student retention and academic performance. The authors call this type of research “low hanging fruit.” This section will review a number of papers having to do with this topic of developing LA tools to track student learning.

Spivey and McMillan (2013) as well as Mo and Zhao (2012) presented research studies focused on using Blackboard LMS to track student data. Spivey and McMillan (2013) investigated the relationship between student effort and performance by utilizing data already being tracked in Blackboard. Student effort was measured by tracking the number of times students accessed study resources within Blackboard. The researchers found that more frequent access and a more evenly spaced study schedule (as opposed to “cramming”) had a positive effect on student performance. Mo and Zhao (2012) had very similar findings. The researchers measured the relationship between student activity

within Blackboard and performance. Specific measures included number of sessions, session time, mail use, and grade. Mo and Zhao (2012) also found a direct relationship between activity and performance. Spivey and McMillan (2013) as well as Mo and Zhao (2012) focused on using the tools already built into the LMS to track student data to monitor students and analyze effort and performance. Similarly, You (2015) found a link between academic procrastination and course achievement when examining LMS data. Procrastination was measured by absence and late submission of assignments. These studies are examples of using the tools at hand to begin implementing the principles of LA in the online classroom.

Romero, Ventura, and García (2008) provided an example of how to utilize open source data mining tools to analyze data readily available in Moodle, another course management system. The researchers detailed the step by step process of extracting, preprocessing, and mining data, and interpreting, evaluating and deploying the results of such data mining efforts. They also described how to use specific data mining techniques such as statistics, visualization, classification, clustering, and association rule mining. They concluded that their work serves as an example of how online instructors can use free tools to apply data mining techniques to their courses.

In a later study, García, Romero, Ventura, and de Castro (2011) expanded on earlier research by describing a standalone data mining tool developed specifically for instructor use in conjunction with the course management system. They provided a tutorial of how to utilize this tool. Again, the researchers described the process of preprocessing, mining, and post-processing the data. In contrast to Romero et al. (2008), this tool was developed specifically for the mining of LMS data, but once again it is

unlikely that an inexperienced user would use such a tool as it is not built directly into the LMS. While Romero et al. (2008) and Garcia et al. (2011) offered less than user-friendly alternatives, they are examples of using the tools at hand to implement LA. Romero et al. (2008) and Garcia et al. (2011) also provided good models of the process of extracting, processing, and mining data as well as interpreting and utilizing the results.

Mazza and Dimitrova (2007) developed and analyzed a student monitoring tool for supporting instructors in online courses. This tool monitors student activity within the course management system, but the focus is on the graphical interface. The researchers surveyed users regarding the effectiveness, efficiency, and usefulness of their tool and found that the use of graphical representations of data was important to the user. Similarly, Ruipérez-Valiente, Muñoz-Merino, Leony, and Delgado Kloos (2015) presented a study of another LA tool that visualized data for the user. Ali, Hatala, Gašević, and Jovanović (2012) presented two evaluations of their tool, LOCO-Analyst, which also focuses on visualizing LMS data for instructors, and, last, Macfadyen and Dawson (2010) discussed the development and implementation of another dashboard-like tool that also visualizes LMS data.

While these four studies included different measures of student performance or usage, they all had a common theme of visualizing data for instructors. For example, Macfadyen and Dawson (2010) found that meaningful information can be extracted from LMS data and tools can be developed which visualize student progress and the likelihood of their success. They all concluded that the visualization aspect is important so instructors are able to readily discern outliers and points of concern and react to such circumstances quickly. Macfadyen and Dawson (2010) also stressed the importance of

customizability by stating that visualization tools must be highly customizable to reflect pedagogical intent in order to accurately represent student performance. Finally, all of these tools leave the intervention to the instructor without flagging or contacting the student automatically.

In another study focusing on visualization of course data, Dyckhoff, Zielke, Bultmann, Chatti, and Schroeder (2012) developed, implemented, and tested a tool, exploratory Learning Analytics Toolkit (eLAT). In contrast to the previously mentioned studies, the primary purpose of this tool was not student monitoring, but monitoring of courses to support teachers in their ongoing reflection, evaluation, and improvement of their instructional design. This is another important use of LA data which is somewhat related to the monitoring of student progress. Mor et al. (2015) pointed out that learning design, teacher inquiry, and LA can form a virtuous circle as LA can be used to inform learning design and the results of this process can be shared through teacher inquiry.

A number of other studies offer different perspectives on the topic of applying LA to monitor student performance. Romero-Zaldivar et al. (2012) provided a case study example of an LA tool, but this one is a virtual machine, which monitors learning activities occurring in a student personal workspace. Romero-Zaldivar et al. expanded on the idea of analyzing LMS data alone, which often presents an incomplete picture of what is happening in the remote learning environment. Hershkovitz and Nachmias (2011) as well as Agudo-Peregrina, Iglesias-Pradas, Conde-González, and Hernández-García (2014) focused more on what type of information should be tracked and whether it was useful to instructors. Hershkovitz and Nachmias (2011) focused not on visualizing information, but categorizing students (low-extent users, late users, online quitters,

accelerating users, and decelerating users) to better inform instructors of what type of learners they are dealing with in order to improve their teaching methods. They also focused on what measures accurately categorized users. Similarly, Agudo-Peregrina et al. (2014) presented a study of how to predict success from log data in virtual learning environments (VLEs). They performed extensive analysis to identify which measures (specifically interactions) are accurate predictors of success.

Hu et al. (2014) presented the development of an LA tool which used specific measures to flag students at risk of course failure. The idea was that with this information instructors could implement early interventions to better enable students to succeed. Unlike previous tools discussed which left intervention to the instructor, this tool automatically generated a “fail the course alert” for the student. It seems many instructors would be hesitant to adopt a non-customizable tool which would send this type of automatic alert to students.

Last, Zacharis (2015) developed a mathematical model to predict student outcomes in blended courses specifically. They took an approach very similar to that of Macfadyen and Dawson (2010). This is technically model research rather than tool research, but it is really just a step in developing tools to predict student success or failure resulting in context-specific conclusions rather than a model that can be generalized to the entire field.

Another common theme found in the literature on LA tools is the development of tools aimed at increasing student retention. Student retention is an administrative problem as well as a problem for instructors. Retention efforts begin in the classroom, so this topic has many stakeholders and touches every level of higher education. Agnihotri and Ott

(2014) presented the development of an LA tool aimed at student retention. They viewed this issue from an administrative level and sought to provide a tool for retention counselors within the university. The purpose of this tool was to provide retention risk ratings for each new freshman before the start of the fall semester. This system, the Student At-Risk Model (STAR), enabled counseling staff to present interventions early when such interventions are most likely to be effective. The researchers recognized that the tool would not be effective if the counseling staff that must ultimately use it were not willing to do so or if the tool itself needed intensive manual interventions. To avoid this problem, the researchers proposed an “end-to-end” design approach that included a great deal of counselor cooperation and input. Agnihotri and Ott (2014) concluded that such tools are capable of increasing student retention, but that the development process must utilize a broad perspective of the entire retention process.

Similarly, Harrison et al. (2015) presented an early alert system designed to identify students at risk of discontinuing enrollment. They included demographic, institution, and learning environment variables in their model resulting in a tool that could accurately predict those at risk of discontinuing. Last, Jayaprakash and Lauría (2014) presented yet another early alert system designed to identify students at academic risk for the purpose of increasing student retention rates.

Knight and Shum (2014) took the discussion of tool development a step further by introducing the idea that the design LA tools should be informed by epistemology, assessment, and pedagogy. They made the point that it is not the tool itself, but the way in which it is wielded, which determines its value. This idea leads to the discussion of LA models to guide the implementation and use of LA tools.

## **Learning Analytics Models**

As described in the previous section, the development of LA tools is a popular area of research in higher education, whether at the course or institutional level. Some common themes from the literature include: the need for customizability, the prevalence of visualization tools, and the prevalence of early detection “alert” tools which flag certain students based on level of risk. As LA research becomes more sophisticated, there is a shift from tool to model development and validation studies that focus on a variety of issues pertaining to LA.

More recent research has gone beyond tool development and validation and begun to take a broader view of the issue of LA model development and validation. Martinez-Maldonado et al. (2015) recognized the need for a framework to help designers systematically develop, evaluate, and deploy effective LA tools. They pointed out that the design of effective LA tools must draw from the methodologies from multiple disciplines such as software development, human-computer interaction, and education. While each of these disciplines has their own development models, there is no accepted methodology for designing LA tools that takes a multidisciplinary approach. They proposed a five-stage workflow with a solid pedagogical underpinning to design, deploy and validate awareness tools in technology-enabled learning environments called LATUX. The stages of this approach include problem identification, low-fidelity prototyping, higher fidelity prototyping, pilot studies, and classroom use. Each stage includes specific steps to make sure the development process considers the learning context and integrates pedagogical requirements resulting in visual analytics tools to inform instructors’ pedagogical

decisions or intervention strategies. In conclusion, they stated that this work is only an initial step towards much research needed in this area.

Similarly, Greller and Drachsler (2012) presented a generic framework to guide the design of LA. The idea was to create a generic framework that would be applicable to a number of different contexts. The framework included the dimensions of internal limitations, external constraints, instruments, data, objectives, and stakeholders. Greller and Drachsler (2012) proposed that by considering these dimensions in the design of LA, the developer would produce a more valuable tool.

Scheffel, Drachsler, Stoyanov, and Specht (2014) further developed this area of research. The authors presented and tested an evaluation framework of quality indicators for LA tools. They recognized that, although these types of tools have become prevalent, there is no accepted measure of quality of such tools. There is a lack of consensus on what constitutes a good, effective, efficient, and useful LA tool. The researchers sought to remedy this problem with their framework which included five criteria of objectives, learning support, learning measures and output, data aspects, and organizational aspects. They found issues with this framework during analysis but recognized that this is just an initial step to much needed research in this area.

Ali, Asadi, Gašević, Jovanović, and Hatala (2013) took yet another perspective on this topic in their study on factors influencing adoption of LA tools. They sought to identify what specific factors would lead instructors to use or not use LA tools. They found that factors such as ease-of-use, perceived usefulness, and information design skills could influence whether instructors choose to adopt LA tools. This is another interesting area of research which could inform the adoption and use of such tools.



Verbert, Manouselis, Drachsler, and Duval (2012) presented another framework relevant to LA research. The purpose of this framework was to aid researchers in the field by offering guidance on the analysis of available datasets that can be used for exploratory research on LA. Swenson (2014) presented a unique perspective on LA model development by suggesting a framework to establish an ethical literacy regarding LA. Swenson (2014) discussed the ethics of specific LA “artifacts” (dashboards, visualizations etc.), the ethical effects of LA, and the establishment of an ethical literacy. The ethical effects of LA included: consequences of classification, identifying power moves, and considering voice. Swenson (2014) pointed out some concerns researchers in the field should consider. Perhaps the categorizing or labeling of students through LA could have some negative or even harmful consequences. Perhaps some of these tools could lead to forms of segregation leaving some students feeling marginalized. It is important that institutions keep these possibilities in mind when adopting these tools so as not to lead to unintended negative consequences for students. Swenson (2014) offered a useful framework to guide the adoption of LA tools, but lacks validation.

Macfadyen and Dawson (2012) pointed out that LA should be consulted and integrated into the institutional strategic planning process. Ferguson et al. (2014) presented a framework to support the implementation of LA at the institutional level. The RAPID (Research and Policy in Development Programme) Outcome Mapping Approach (ROMA) Framework was adapted for the context to offer guidance on institutional implementation of LA. The steps of the approach include: define a clear set of overarching policy objectives; map the context; identify the key stakeholders; identify LA purposes; develop a strategy; analyze capacity and develop human resources; and

develop a monitoring and learning system. Additionally, they provided a number of case studies to discuss the implementation of this framework at different institutions. This study shows how such a general framework can be adaptable to apply to different situations or LA tools.

Although no specific framework or model was presented, Dringus (2012) described a number of principles for the adoption of LA tools while expressing an attitude of caution when considering LA as being potentially “harmful.” Five principles were stated as “musts” for LA in online courses:

- LA must develop from the stance of getting the right data and the data right;
- LA must have transparency;
- LA must yield from good algorithms;
- LA must lead to responsible assessment and effective use of the data trail; and
- LA must inform process and practice.

These principles could be very useful in developing a model to guide instructor use of LA.

West et al. (2016) presented a framework for LA implementation in relation to student retention. This framework was meant to stimulate a discussion about the institutional implementation of LA. The “let’s talk learning analytics” framework included six key domains which are the areas an institutional needs to consider when implementing LA for student retention. These domains include institutional context, transitional institutional elements, LA infrastructure, transitional retention elements, LA for retention, and intervention and reflection. Discussion questions were provided for each of the domains. The framework is meant to stimulate a dialogue and foster a foster a

collegial approach to the implementation of LA across institutions. The themes identified by West et al. (2016) could be very useful in developing an implementation model for instructor-specific use of LA as well.

Perhaps most relevant to this study are the frameworks presented by Wise (2014) and Wise et al. (2016). Wise (2014) presented a discussion of designing interventions based on the output of LA tools pointing out that this part of the process is often ignored and is a relatively unexplored area of research. There are three specific aspects of the application of LA: what traces of learning should be captured, how to present these traces to learners, and how to frame the inclusion of analytics as part of the course activity to guide their use in productive decision-making by learners and teachers (Wise, Zhao, & Hausknecht, 2014). These interventions have to do with the latter two aspects. Wise (2014) pointed out that as LA tools are becoming more prevalent, intervention design becomes critical to their effective implementation and offered the following important research questions: when in the teaching and learning process should analytics be consulted; who should be accessing analytics; why are they being consulted; and most importantly, how the use of the analytics articulates with the rest of the teaching and learning practices taking place.

Wise (2014) began to answer some of these questions by presenting a framework of four principles of pedagogical LA intervention design including: Integration, Agency, Reference Frame, and Dialogue. Within these principles three core processes of Grounding, Goal-Setting, and Reflection were described. The actual application of a slightly different version of this framework was presented by Wise et al. (2016). The framework consisting of integration, diversity, agency, reflection, and dialogue was used

to design embedded and extracted LA interventions to monitor activity in online discussions. The use of the LA intervention was framed as an integral part of the learning activity. This study showed how such a framework can guide use of LA and empower students to take responsibility for regulating their own learning process.

A revised and extended version of this framework was presented by Wise et al. (2016). The study first presented a discussion of challenges faced by learners when attempting to interpret and make decisions based on analytics. Next, they presented a model for student use of LA as a part of a self-regulatory cycle of grounding, goal-setting, action, and reflection, the Student Tuning Model. The Student Tuning Model suggests that students engage in a continual cycle of planning, monitoring, and adjusting their learning practices as they are informed by analytics. The element of Grounding has to do with the relationship between the information the analytics provide and the specific educational context in which they are being provided. Students must understand the purpose of the learning activity, what represents meaningful engagement in the activity, and how the LA provided will reflect this to the student. Goal-Setting has to do with the student planning specific objectives and actions for reaching them in relation to the larger context established through Grounding. Action is when students engage in behaviors to realize their goals. Reflection occurs when students use analytics to reflect on the actions they took in comparison to the goals they set.

The Student Tuning Model was meant to outline how students might productively engage with analytics. Wise et al. (2016) also provided a framework for pedagogical design to support student use of analytics, the Align Design Framework. The Align Design Framework, presented with initial validation, includes the four principles of

Integration, Agency, Reference Frame, and Dialogue/Audience. The first principle of Integration states that the instructor should position student analytics use as an integral part of the learning process. They provide suggestions for how Integration can be achieved both conceptually and practically.

The second principle of the framework is Agency which has to do with students taking ownership of their learning process. LA should help students to take an active role in their learning and encourage them to do so. Instructors should encourage students to set individual goals for themselves and self-regulate by engaging in self-reflection throughout the term to see where they are on the path to meeting their goals. LA can support the process of self-reflection by providing students a record of their progress. Individual goals provide a personalized context for making sense of the analytics and allow for flexibility of interpretation.

The principle of Reference Frame states that instructors should provide a comparison point to students. This comparison point may differ depending on the instructor's intent, but it should be incorporated into the use of LA throughout the term. The reference frame could be a personal reference where students compare their level of activity with their prior activity, one where the student compares their activity with a benchmark provided by the instructor, or one in which students compare their progress with other students in the course. Any of these are valid, but the instructor must be intentional in choosing the appropriate reference frame for their course.

The final principle of this framework is Dialogue/Audience. This principle states that the instructor should create an environment where interpretation of analytics is discussed between the instructor and students so that students don't simply feel that they

are being watched. The student should feel that their voice is heard. Dialogue between the student and instructor should take place throughout the term so the student feels that the LA are there to help them. If the students feel that the LA are simply monitoring them this could be a point of distrust and stress.

While this framework is a good starting point, the research problem remains that there is a lack of evidence-based guidance on how instructors can effectively implement LA to support at-risk students. Many LA tools are designed to present information only to the instructor and not the student. Wise's (2014) framework does little to help in this situation. Lockyer et al. (2015) addressed this issue in part by presenting the idea that a conceptual framework should be established for typical LA patterns expected from particular learning designs in order to better help teachers interpret the information that analytics provides. The idea is that the LA measures should be mapped back to the course learning design in order for the analytics to appropriately reflect pedagogical intent. This mapping creates a practice where instructors will document their pedagogical intent in their learning design which then serves as a means of querying the analytics and making sense of the information provided. Lockyer's model was not fully developed or validated, but the authors presented an example of its application by suggesting a practice of identifying in the learning design what activity patterns would be expected for a student to be successful, and using analytics as a checkpoint to identify student progress during the learning activity. Lockyer's model has a narrow focus on how learning design can inform the use of LA and is difficult to generalize to a variety of learning situations.

## **Learning Analytics Implementation**

In addition to model and tool development research, several studies are specifically relevant to the discussion of LA implementation, but do not offer a model or framework as guidance. van Leeuwen, Janssen, Erkens, and Brekelmans (2014) discussed how LA can be used to support teachers in guiding student discussion and participation in an online learning environment utilizing computer-supported collaborative learning (CSCL). They presented a test group of instructors with a set of simulations of student discussion, some of which included problems that warranted some sort of intervention. Some instructors were provided LA visualization tools while a control group was provided no such tools. Upon observing the instructors' interaction with students, the main findings were that when presented with LA tools and visualizations, teachers intervened more often, were better able to target those needing intervention, and presented more specific interventions to problematic students. In a related discussion of CSCL and LA, Rodríguez-Triana, Martínez-Monés, Asensio-Pérez, and Yannis Dimitriadis (2015) made the additional point that LA can be used to support the design of CSCL situations.

In a later study, van Leeuwen, Janssen, Erkens, and Brekelmans (2015) focused not on students collaborating in discussions, but on students collaborating together on group projects. The method and findings were similar to Rodríguez-Triana et al. (2015). The researchers found that when equipped with LA tools, teachers offered more support in general which indicates that LA tools increase teachers' confidence to act. Leeuwen et al. (2015) offered a useful means of measuring teachers' interventions. Interventions

were coded according to frequency, focus, means, and specificity. This type of coding could be very beneficial in research concerning instructor implementation of LA.

Jayaprakash, Moody, Lauria, Regan, and Baron (2014) presented an LA tool to identify at-risk students similar to those discussed in previous sections, but the focus of this research was on how to present interventions to these at-risk students. They sought to test the effectiveness of two different intervention strategies. Students receiving the Awareness Messaging intervention received a message indicating that they were at risk of not completing the course successfully along with guidance on what they might do to improve their chance of success. Those receiving Online Academic Support Environment (OASE) intervention received a similar message except that instead of specific recommendations, the students were encouraged to join the institution's OASE where they were given access to additional instructional materials and provided with mentoring services. The researchers realized that intervention strategies should not be too burdensome on instructors so as not to risk them being ignored. Instructors were made aware of those students who might require attention and were provided with preformatted messages that could be used to reach out to students. They were also encouraged to recommend office hours visits, tutoring, and study groups. All students requiring intervention received similar messages, but some were also provided with access to the OASE. Ultimately, the researchers found that simple intervention strategies to alert students that they may be academically at-risk can positively impact learning outcomes and that providing access to the OASE showed no apparent benefit over simply alerting students of their potential academic risk. They also found that these interventions can have unintended consequences such as students withdrawing from the course.



## **Design and Development Research**

Richey and Klein (2007) offer useful guidance on model construction and validation. The authors argue that design and development research is lacking in the area of empirical testing and validation of models and tools with many such being accepted based solely on user testimonials as evidence of their effectiveness. The authors provide a thorough guide to methodologies and strategies for the many categories of research within this field. Of particular interest here is model development and internal validation research methods and strategies, participant selection, data collection, and interpretation of findings.

Tracey (2009) as well as Tracey and Richey (2007) presented the construction and validation of a multiple intelligences instructional design model. Both studies reflect Richey and Klein's (2007) design and development research principles put into practice. Particularly, the utilization of Delphi panel techniques in these studies will be helpful to the researcher in her effort to validate the LA model for instructor use utilizing similar means.

Hamann (2015) presented the construction and validation of a mobile-learning framework for online and blended learning environments. This study is one example of model construction and internal validation, and is of similar structure to this study. The main difference is that Hamann (2015) focused on mobile learning (m-learning) rather than LA. Hamann (2015) conducted a review of literature to address the research question "what are the benefits and limitations of m-learning technologies, and how are these technologies being used to support teaching and learning in higher education?" (p. 4). The author then conducted a stakeholder needs assessment to address the research

question “what are the stakeholder needs that must be considered when adopting m-learning technologies to support online and blended teaching and learning in higher education?” (p. 4-5). Next, the review of literature and needs assessment informed the design of an m-learning framework. Then, the author utilized expert review Delphi panel technique to modify and internally validate the framework.

### **Summary**

This review of literature presented the current state of the body of knowledge in the field of LA. A synthesis of literature addressing LA tools and models was presented as well as literature addressing the implementation of LA, that is, the use of analytics in practice. Additionally, design and development research as a useful methodology for this study was introduced. Chapter 3 describes the design and development methods that were used in this study in greater detail.

## Chapter 3

### Methodology

#### **Overview**

A qualitative design and development research approach (Richey & Klein, 2007) was used to address the research problem that there is a lack of evidence-based guidance on how instructors can effectively implement learning analytics (LA) to support at-risk students. Specifically, model construction and validation methods were used to construct an instructor LA implementation model to support at-risk students. The study took place within SWOSU and focused on the use of the LA tools available there.

First, the review of literature served as the basis for answering the first research question: what LA tools and models are currently available to instructors, how are they using these tools and models to support teaching and learning, and what are the benefits and limitations of such LA tools and models? Next, a needs assessment was conducted to address the second research question: what needs to be considered to design an effective model to guide instructors in using LA tools and implementing interventions? A survey and a follow-up focus group were used to identify needs of stakeholders including instructors, online learning administrators, and online learning committee members. Then, a preliminary model to guide instructors in the use of LA tools was designed based on the review of literature and the needs assessment which addressed the third research question: how can stakeholder needs inform the design of such a model? The next phase included an expert review of the model using Delphi panel technique. This approach addressed the fourth research question: how do instructors perceive the effectiveness and

efficiency of the proposed LA model? Last, modifications were made to the model to implement suggestions from the Delphi panel, which addressed the fifth research question: what modifications are needed to improve the proposed LA model? This three-phase process (i.e., needs assessment, model construction, and model validation) resulted in a model, which is useful to instructors wanting to effectively implement LA tools in their online courses. The following sections provide details according to these three phases.

### **Phase 1: Needs Assessment**

A needs assessment is an instructional design strategy that is used to identify gaps in performance and to determine whether the gaps are worth addressing through an intervention (Morrison, Ross, Kalman, & Kemp, 2011). A needs assessment was conducted to: identify how instructors are using LA; identify gaps in knowledge, skill, and ability regarding use of LA; and determine whether the proposed model would be a useful and effective intervention strategy. The data gathered addressed the research question: What needs to be considered to design an effective model to guide instructors in using LA tools and implementing interventions? The needs assessment as well as the review of literature informed the construction of an instructor LA implementation model to support at-risk students.

According to Morrison et al. (2011), there are six identifiable categories of needs:

- Normative needs are identified by comparing the target audience against a standard.
- Comparative needs are similar to normative needs, but rather than comparing the target to group to a standard, they are compared to a peer group.

- Felt needs exist when an individual “feels” that there is a need for instruction.
- Expressed needs are “felt needs turned into action” (p. 35).
- Anticipated or future needs exist when a change that will happen in the future will create a need for instruction in the present.
- Critical incident needs are found by identifying potential problems such as natural disasters or accidents.

The categories that are relevant to this study are felt, expressed, and future/anticipated. In particular, future/anticipated needs are key given that SWOSU (and other higher education institutions) are rolling out LA tools with little or no thought to the knowledge and skills faculty need to have to use the tools effectively. The needs assessment focused on identifying these categories of needs.

The needs assessment followed a four phase process of planning, collecting data, data analysis, and final report (Morrison et al., 2011). The planning phase included instrument development and validation and participant selection. Then, data were collected, analyzed, and reported. The needs assessment consisted of an online survey and a follow-up focus group. The following provides details of how the needs assessment process was carried out.

#### *Instrument Development and Validation*

The development of the needs assessment survey instrument and focus group protocol (Appendices A & B respectively) was guided by the research questions, review of literature, and the researcher’s personal experience. The survey and focus group protocol were designed to collect data regarding the following issues:

- How often are LA tools being utilized by online instructors?

- When during the learning process are LA tools being accessed/used?
- What purpose do these tools serve?
- Do instructors feel that these tools are beneficial? How?
- Do these tools seem to be resulting in improved learning outcomes?
- Do instructors feel the need for better guidance regarding the effective use of these tools?

The survey consisted of four demographic questions (multiple choice and open-ended), six questions regarding prior use and perceptions (Likert-type scale responses with level of agreement on a scale of 1-5 ranging from Strongly Disagree to Strongly Agree), four questions regarding efficacy (three Likert-type scale and one multiple choice), one open-ended question regarding model construction, and one yes/no question regarding focus group participation. If survey respondents were willing to participate in a focus group, they were also asked to provide name, email address, and phone number at the end of the survey. The one open-ended question was meant to elicit more detailed responses regarding participants' attitudes and perceptions toward the design of such a model.

The focus group protocol was designed to solicit more detailed responses regarding the development of the model for qualitative analysis. The protocol consisted of questions similar to those found in the survey, but these were open-ended and meant to stimulate discussion. The protocol guided the discussion, but the focus group was semi-structured. The researcher also asked impromptu questions based on participants' responses in addition to these guiding questions when appropriate.

Both instruments were validated through an expert review. Once the survey and focus group protocol were developed based on the research questions, review of literature, and researcher's personal experience, the instruments were submitted to some key users of LA at SWOSU for review. One user is the Director of the Center for Excellence in Teaching and Learning (CETL) at SWOSU. CETL's mission states:

The mission of the Center for Excellence in Teaching and Learning is to support the University's mission of enriching students' educational experience with faculty members who effectively combine teaching, scholarship, and technology to help create a campus culture that values and supports excellence in teaching, learning, and research in the latest uses of technology in the classroom. The Center for Excellence in Teaching and Learning at Southwestern Oklahoma State University includes support, resources and services that enable faculty to achieve excellence, integration, and satisfaction in the areas of distance and eLearning, teaching, eLearning scholarship, and classroom technology proficiency across their career lifespan.

The Director has been employed at the university since 1988. She holds a B.S. degree in Business Administration, a B.S. degree in Computer Science—Information Science Emphasis, and a Master of Business Administration degree from SWOSU. She is the university's expert for all issues related to online learning. The other key user is the RN to BSN coordinator at SWOSU. This is an entirely online program that uses Dropout Detective extensively. The coordinator was a champion for introducing Dropout Detective at SWOSU. The instruments were emailed to these experts for review. Both reviewers provided feedback and modifications were made to the instruments. The

instruments were sent to them again for final review, and no further modifications were recommended.

### *Data Collection*

The researcher secured Institutional Review Board (IRB) approvals from Nova Southeastern University (NSU), the university where the researcher is a PhD candidate and from SWOSU, the university where the study was conducted (Appendices C & D respectively). An email (Appendix E) was sent to all faculty at SWOSU (approximately 350) and administrators and online learning committee members who are familiar with the available LA tools and included an attached participation letter (Appendix F) for the purpose of attaining informed consent. The email explained the purpose of the study and a link to the location of the Web survey. The survey collected demographic information as well as information regarding the use of LA tools. There was no incentive offered to those who completed the survey. A reminder email was sent to participants one week after the initial email was sent.

According to Krueger and Casey (2000), a focus group is a carefully planned series of relaxed discussions, led by a facilitator, among a small group. The purpose is to obtain perceptions on a defined area of interest. The participants should share some commonality regarding the topic of discussion. This focus group discussed the participants' use of LA in their courses. The goal was not to reach consensus, but to elicit feedback. Those who responded in the survey that they were willing to participate in a focus group were contacted via email (Appendix G) after the survey was finalized with additional information about the purpose of the focus group session. The researcher utilized the online scheduling tool, Doodle, to find the best time and date for maximum



participation. Once the time and dates were set a final invitation was sent via email. A focus group should take place in a permissive environment where participants feel comfortable sharing their opinions (Krueger & Casey, 2000). The focus group took place on the SWOSU campus in a room with a roundtable arrangement. This was a convenient and comfortable setting for participants. A focus group should include no more than five to ten participants (Krueger & Casey, 2000). Twenty respondents were willing to participate in the focus group so the researcher offered two sessions and was able to divide the participants evenly according to availability. The researcher facilitated the discussion using the developed and validated protocol (Appendix B) and took notes to record qualitative data. An additional note taker assisted the researcher. The note taker was the researcher's teaching assistant. Participants were asked to sign a Focus Group Consent Form (Appendix H).

### *Sample*

The survey was distributed to all faculty at SWOSU and administrators and online learning committee members who are familiar with the available LA tools (approximately 350). This was a convenience sample, but was representative of faculty and administrators at large who use LA tools. Faculty using Dropout Detective are motivated to do so because they volunteered for the pilot program and, given they teach in a fully online program, these faculty also seek ways to engage and monitor their remote students. Online learning committee members and administration made the decision to purchase Dropout Detective after watching a number of demonstrations and working closely with a representative from AspirEdu and are therefore heavily invested in the use of the tool. The use of Canvas Analytics is driven mainly by personal

motivation or interest in LA. Chosen participants represent a meaningful group. Whether they use one or both of these tools, they teach online, face-to-face, or hybrid courses in an ever increasingly technological learning environment. Focus group participants were selected from survey respondents based on willingness to participate. This sample also represents a meaningful and experienced group due to being selected from the survey sample.

### **Phase 2: Model Construction**

A preliminary instructor LA implementation model to support at-risk students was developed based on the results of the needs assessment and review of relevant research literature. This preliminary model includes both conceptual and practical guidelines for implementing LA in the online classroom. The model was validated internally in phase three of the study.

### **Phase 3: Model Validation**

Once the preliminary model was established based on the review of literature and needs assessment, a Delphi study method (Dalkey & Helmer, 1963) was utilized to conduct an internal validation of the model. The Delphi technique is a widely used and accepted method for gathering data from a group of experts with the goal of reaching consensus of opinion (Hsu & Sandford, 2007). When using the Delphi technique, the researcher solicits input from a group of experts, makes revisions based on the feedback, and continues this cycle until consensus is reached on whatever problem is being solved.

#### *Data Collection*

The researcher sent the preliminary model via email to the experts included in the Delphi panel and requested feedback. The Delphi panel was asked to review the model in

terms of whether it adheres to the suggestions made during the focus group discussion as well as in terms of usability of the model. Rubin and Chisnell (2008) state that the attributes of usability are usefulness, efficiency, effectiveness, learnability, satisfaction, and accessibility.

- Usefulness refers to whether a product enables the user to achieve their goal.
- Efficiency concerns how quickly the user can attain their goal.
- Effectiveness denotes whether the product behaves as the user expects.
- Learnability refers to the user's ability to "figure out" and become comfortable with the product in a timely manner.
- Satisfaction refers to the user's general feelings about the product.
- Accessibility is the ability of user's with disabilities to realize the usefulness of the system to the same degree those without disability do.

The model evaluation criteria assessed the usability elements of satisfaction, usefulness, efficiency, effectiveness, and learnability.

Participants were given approximately two weeks to review the model and answer an open-ended questionnaire for each round of the Delphi study. The initial email including the questionnaire with evaluation criteria is included in Appendix I. The email included an attached participation letter (Appendix J) for the purpose of attaining informed consent from participants. After each iteration of feedback, the researcher made revisions to the model. Rounds were conducted until consensus was reached, and a final model was eventually presented for final approval by the panel.

### *Sample*

The Delphi panel consisted of three highly experienced LA users at SWOSU. The results of the initial survey and focus group informed the selection of participants for the Delphi panel. Other factors such as experience with LA, experience in teaching, and participation in SWOSU's Excellence in Teaching and Learning Committee (ETLC) also played a role in the selection of expert users for the Delphi panel. All members of the Delphi panel participated in the focus group. This enabled them to assess whether the model addressed the needs and opinions voiced during the focus group session. Two of the Delphi panel participants were those who validated the instruments for this study. The first participant was the Director of CETL which provides support, resources, and services that enable faculty to achieve excellence, integration, and satisfaction in distance and eLearning, teaching, and classroom technology. The director also has many years of teaching experience at SWOSU in the department of business and computer science. The second Delphi panel participant is a faculty member in the nursing department who also serves as the RN to BSN coordinator and was a champion for implementing Dropout Detective in her program. The third participant is a faculty member in the English department, has served on the Distance and eLearning Council at SWOSU for several years, and was instrumental to the focus group sessions. This panel represented members of both focus group sessions.

### **Data Analysis**

The following table summarizes the data collection and analysis methods used to address each research question. Further details on data analysis strategies follow the table.

**Table 1.** *Research Questions, Data Collection and Analysis*

<b>Research Question</b>	<b>Data collection methodologies</b>	<b>Data analysis</b>
1) What LA tools/models are currently available to instructors and how are they using these tools/models to support teaching and learning? What are the benefits and limitations of such LA tools/models?	1. Review of the research literature.	Synthesize the current body of knowledge regarding LA tools/models.
2) What needs to be considered to design an effective model to guide instructors in LA implementation to support at-risk students?	1. Survey to gather needs assessment data from stakeholders (i.e. faculty, administrators, and online learning committee members).  2. Focus group with a subset of participants who completed the survey.	Analyze survey responses both quantitatively (demographics and Likert-type questions) and qualitatively (open-ended questions).  Qualitatively analyze responses to both survey open-ended and focus group questions using the Qualitative Data Analysis Spiral technique (Creswell, 2012).
3) How can stakeholder needs inform the design of such a model?	1. Review of the research literature.  2. Review of needs assessment data.	Review the literature and data collected through the needs assessment within the context of developing an instructor LA implementation model to support at-risk students.
4) How do instructors perceive the effectiveness and efficiency of the proposed LA model?	1. Input gathered from stakeholders using a Delphi panel technique.	Evaluate feedback from Delphi Panel.
5) What modifications are needed to improve the proposed LA model?	1. Evaluation of feedback from Delphi panel.	Revise model based on Delphi panel feedback.

Data analysis primarily took place during the needs assessment phase (survey and focus group). Both quantitative and qualitative data were collected. Quantitative data were collected through the Likert-type and multiple choice survey items. Information regarding demographics, prior use and perceptions, efficacy, and focus group participation was examined and reported using Survey Monkey's analysis features and Excel.

Qualitative data were collected through the survey and focus group. The survey included one open-ended question soliciting opinions regarding model construction: *What do you need to be able to know or do in order to use learning analytics tools (e.g., Dropout Detective) to identify at-risk students and implement strategies to help them succeed?* Qualitative data were collected during the focus group according to the focus group interview protocol, which included a number of open-ended questions meant to stimulate discussion. Thorough notes were taken by the researcher (and an additional note-taker) during the focus group session to record participants' feedback. These notes as well as the responses to the open-ended survey question were analyzed according to the Qualitative Data Analysis Spiral (Creswell, 2012). This data analysis model is an iterative process consisting of the following steps: data collection; data managing; reading and memoing; describing, classifying, and interpreting data into codes and themes; and representing and visualizing data. Creswell (2012) makes specific suggestions of how to apply this process to case study research. These suggestions are applicable here and include the following: create and organize files for data; read through text, make margin notes, and form initial codes; describe the case and its context; use categorical aggregation to establish themes or patterns; use direct interpretation and

develop naturalistic generalizations of what was “learned”; present in-depth picture of the case (or cases) using narrative, tables, and figures. This process was followed for analyzing and interpreting qualitative data. Quirkos qualitative data analysis software was also used and to identify themes and code data.

### **Formats for Presenting Results**

The purpose was to identify needs of faculty regarding the use of LA tools in their online courses in order to develop an instructor LA implementation model to support at-risk students. The data collected through the survey and focus group were analyzed and results are presented using tables and detailed descriptions according to the following categories: 1) descriptive characteristics of survey and focus group participants; 2) analysis of survey data; 3) analysis of data collected from the focus group; and 4) detailed description of the developed instructor LA implementation model.

### **Resource Requirements**

The first resource required for this study was access to the literature on LA for review. This resource was readily available through the NSU as well as SWOSU libraries, which provide access to journals, conference proceedings, dissertations, etc. The next resource required was access to participants for the needs assessment. Instructors utilizing LA tools at SWOSU, online learning committee members, and online learning administration were included as participants. These are the researcher’s colleagues, and they were willing to participate. Some peers who use the LA tools were contacted and consulted as subject matter experts in the early stages.

Software required for the needs assessment (survey and focus group) included: Survey Monkey (to administer the survey); Doodle, email, and telephone (to plan and

organize the focus groups sessions); Survey Monkey, Quirkos, and Microsoft Excel (to analyze the data). The researcher had access to all software requirements.

Additionally, experts in the field were required to conduct the Delphi panel. Experts were defined as key users of LA at SWOSU with considerable experience with online learning and teaching. The Delphi panel process also required email communication with experts, which was a resource readily available to the researcher. The researcher secured access to both LA tools within her own courses during the study.

### **Summary**

This chapter outlined the research methods and data sources used to conduct the needs assessment, model construction, and model validation. Critical issues such as instrument development and validation, data collection, sample, data analysis, and formats for presenting results have been presented in detail.



## Chapter 4

### Results

#### **Introduction**

This study was designed to identify stakeholder needs regarding the implementation of learning analytics (LA) at the course level in order to develop and validate a model to support instructor use of LA. The researcher began by conducting a needs assessment including a survey and two focus group sessions. The survey was used to collect quantitative and qualitative data from instructors regarding the use of LA in their courses. The survey included questions in the categories of demographics, prior use and perceptions, efficacy, model construction, and focus group participation. The focus group sessions were meant to elicit more detailed information from participants. The first session had seven participants in attendance, and the second had ten. Next, data from the survey and focus group sessions were analyzed in the context of the research questions and a model was developed based on the review of literature and analysis of the data. Last, the model was reviewed by a Delphi panel until consensus was reached. The model was approved by the panel, which serves as internal validation.

The results of this study are presented here according to its three major phases: 1) needs assessment, 2) model construction, and 3) model validation. The needs assessment section includes analysis and results of the quantitative data collected with the survey, as well as qualitative data collected using the open-ended survey item and focus group sessions. The model construction section includes a description of the developed model that resulted from the data analysis and review of literature. The model validation section

includes a description of the Delphi panel process and results. This chapter concludes with a summary of results.

### **Phase 1: Needs Assessment**

#### *Quantitative Data Analysis and Results*

The survey was sent to approximately 350 full-time and adjunct faculty from both SWOSU campuses. All SWOSU faculty are required to use the learning management system (LMS) and have the LA tool, Canvas Analytics, available to them. Although this tool may be most useful in online courses, it has applicability in online, face-to-face, or blended courses. Therefore, the researcher chose to send the survey to all faculty, whether currently teaching online courses or not. See Appendix A for the survey instrument.

There were 61 (i.e., 17.42%) responses to the survey. Tables 2, 3, 4, and 5, respectively, report the age, gender, teaching discipline, and online teaching experience of survey respondents. Table 2 shows the age of respondents, which was well distributed within the age brackets of 25 and up. Table 3 shows that the majority of respondents (65.6%) were female. This is representative of the population. Table 4 shows that respondents represented a wide variety of teaching disciplines. Table 5 shows that a portion of respondents (39.3%) reported to have no online teaching experience, but the majority reported to have some.

**Table 2.** *Survey Respondents' Age (n=61)*

<b>Answer Options</b>	<b>Response Percent</b>	<b>Response Count</b>
<18	0.0%	0
18 - 24	0.0%	0
25-34	9.8%	6
35-44	37.7%	23
45-54	19.7%	12
55+	32.8%	20
I prefer not to say	0.0%	0
Answered question		61
Skipped question		0

**Table 3.** *Survey Respondents' Gender (n=61)*

<b>Answer Options</b>	<b>Response Percent</b>	<b>Response Count</b>
Male	32.8%	20
Female	65.6%	40
I prefer not to say	1.6%	1
Answered question		61
Skipped question		0

**Table 4.** *Survey Respondents' Teaching Disciplines (n=61)*

<b>Answer Options</b>	<b>Response Percent</b>	<b>Response Count</b>
Nursing	11.9%	7

Business	8.5%	5
Music	6.8%	4
English	6.8%	4
Allied Health Sciences	6.8%	4
Computer Science	6.8%	4
Chemistry	5.1%	3
Engineering Technology	5.1%	3
History	3.4%	2
Education	3.4%	2
Sports Management	1.7%	1
Pharmacy	1.7%	1
Marketing, Management, Finance	1.7%	1
Administration	1.7%	1
Management/Entrepreneurship	1.7%	1
Mathematics	1.7%	1
Psychology	1.7%	1
Senior Semester Nursing Students, Acute care and Leadership	1.7%	1
Finance	1.7%	1
Communication	1.7%	1
Computer/Business	1.7%	1
Health Information Management	1.7%	1
Radiologic Technology	1.7%	1

Economics and Statistics	1.7%	1
Life Sciences	1.7%	1
General Studies	1.7%	1
Counseling	1.7%	1
Theatre	1.7%	1
Basic Sciences	1.7%	1
Language and Literature	1.7%	1
Computer Science/Entrepreneurship	1.7%	1
Answered question		59
Skipped question		2

**Table 5.** Respondents' Online Teaching Experience (n=61)

Answer Options	Response Percent	Response Count
<5 years	27.9%	17
5-10 years	18.0%	11
10+ years	14.8%	9
No experience	39.3%	24
Answered question		61
Skipped question		0

After faculty entered the survey and completed the demographic information, they were asked a series of questions regarding their prior use and perceptions of LA tools.

This portion of the survey was meant to gauge the level of experience and perceptions of

LA tools being used by faculty at SWOSU. This section included six questions with Likert-type scale responses with level of agreement on a scale of 1-5 ranging from Strongly Disagree to Strongly Agree. Table 6 summarizes these responses.

**Table 6.** *Prior Use and Perceptions of Respondents (n=61)*

	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neither agree nor disagree</b>	<b>Agree</b>	<b>Strongly agree</b>	<b>Total responses to question</b>
I use learning analytic tools often.						
Number	8	13	7	17	6	51
Percentage	15.69%	25.49%	13.73%	33.33%	11.76%	
Learning analytic tools are beneficial in my course/program/university.						
Number	2	0	18	24	7	51
Percentage	3.92%	0%	36.29%	47.06%	13.73%	
I am able to use the information generated by learning analytics to identify students who may be at-risk.						
Number	3	2	17	22	7	51
Percentage	5.88%	3.92%	33.33%	43.14%	13.73%	
I am able to use the information generated by learning analytics to help students get back on track.						
Number	3	4	21	18	5	51
Percentage	5.88%	7.84%	41.84%	35.29%	9.8%	
The use of learning analytics results in better learning outcomes for my students.						
Number	3	1	20	24	3	51
Percentage	5.88%	1.96%	39.22%	47.06%	5.88%	
I use learning analytics effectively to help at-risk students.						
Number	3	5	20	21	2	51
Percentage	5.88%	9.8%	39.22%	41.18%	3.92%	

“Agree” and “neither agree nor disagree” responses held the majority of respondents for all but the first question, but the statement “I use learning analytic tools often” received quite a few “disagree” responses. It seems that perceptions are fairly positive regarding LA tools, but their actual use is somewhat lower. The most common response to these six Likert-type scale questions was “agree.” One question was the exception to this with the most common response being “neither agree nor disagree” to the statement that they are able to use the information generated by learning LA to help students get back on track. This is telling in that while respondents had positive perceptions for most aspects of LA use, they were slightly less positive regarding their ability to use the information generated by LA to help students get back on track.

The next section of the survey was meant to measure respondents’ efficacy regarding LA use. This section included one multiple choice question and three Likert-type scale questions. These survey items examined instructors’ confidence using LA and need regarding its implementation. Tables 7 and 8 summarize data regarding efficacy.



**Table 7. Efficacy of Respondents- Multiple Choice (n=61)**

<b>Choose the statement that most resembles your attitude toward incorporating learning analytics in your classroom:</b>		
<b>Answer Options</b>	<b>Response Percent</b>	<b>Response Count</b>
I am able to effectively incorporate learning analytics into my classroom	33.3%	17
I will be able to effectively incorporate learning analytics into my classroom with training	64.7%	33
I don't think I'll be able to effectively incorporate learning analytics into my classroom	2.0%	1
	<i>answered question</i>	<b>51</b>
	<i>skipped question</i>	<b>10</b>

**Table 8: Efficacy of Respondents – Likert-type Scale (n=61)**

	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neither agree nor disagree</b>	<b>Agree</b>	<b>Strongly agree</b>	<b>Total responses to question</b>
I could use guidance on how to effectively use the data generated by learning analytics to help at-risk students.						
Number	1	3	3	34	10	51
Percentage	1.96%	5.88%	5.88%	66.67%	19.61%	
I would use learning analytics more effectively if I could reference a model that showed me how to use/apply information generated by such tools.						
Number	2	2	4	29	14	51
Percentage	3.92%	3.92%	7.84%	56.86%	27.45%	
Such a model would be useful to me						
Number	2	2	4	29	14	51
Percentage	3.92%	3.92%	7.84%	56.86%	27.45%	

The majority (64.7%) stated that they would be able to effectively incorporate LA in the classroom with training. Only 33.33% felt that they were currently able to incorporate LA, and only 1.96% felt that would not be able to effectively incorporate LA. The items “I could use guidance on how to effectively use the data generated by learning analytics to help at-risk students”, “I would use learning analytics more effectively if I could reference a model that showed me how to use/apply information generated by such tools”, and “such a model would be useful to me” all received a majority response of

“agree” with a second most common response of “strongly agree”. Very few responded negatively to these items.

The survey confirms the desire to implement LA in the classroom and the need for instruction on how to effectively do so. The next section of the survey asked the open-ended question: “What additional information or training would enable you to use learning analytic tools (e.g., Canvas Analytics or Dropout Detective) more effectively?” Of the 61 respondents, 34 provided a response to this question. This qualitative data were loaded into Quirkos software for analysis. The text was coded according to themes with the notes from the focus group session, which was meant to solicit the same type of information. Analysis of this question is included in the next section.

The next section of the survey asked participants if they would be willing to participate in a focus group to further identify what needs to be considered in the development of a model to guide instructors in the effective implementation of LA to support at-risk students. Of the 49 participants who answered this question, 31 responded that they would be willing to participate (63.3%). Those who answered yes provided their contact information (name, email address, phone number) in the next section of the survey.

### *Qualitative Data Analysis and Results*

The next phase was the focus group. The researcher conducted two focus group sessions because of the large number of willing participants. There were 31 survey respondents who stated they would be willing to participate in the focus group. The online scheduling tool, Doodle, was used to find the best times and dates for the sessions based on participant availability. The researcher was able to schedule two sessions based

on availability. A few of those who responded to the survey that they were willing to participate either did not respond to the email or, in the end, were unable to attend the available sessions. Therefore, the focus group sessions were attended by a total of 17 participants. The first session had seven participants including six faculty members and one administrator. The second session had ten participants including nine faculty members and one administrator. The focus groups took place on the researcher's and participants' campus at a location that was convenient and easily accessible in a room with a round table layout. A semi-structured approach was used, with the researcher using the focus group protocol (Appendix B) to loosely guide the discussion and asking follow up questions when necessary. The researcher took brief notes and had a teaching assistant take an additional set of notes. At each session, the researcher explained the study and participants were required to sign a consent form (Appendix H), which explained the purpose of the study and any risks and benefits associated with their participation. All participants agreed to the terms of the study and signed the form. Each focus group session was scheduled to run about one hour. Both sessions ran about 15 minutes over the allotted hour due to rich discussion that occurred. No video or audio recordings were taken, and all protocols were followed according to the IRB approvals of SWOSU and the University where the researcher is a PhD candidate.

Immediately following the first session, the researcher took both sets of notes and typed them into a Microsoft Word document. Additional details based on the researcher's recollection were added while the session was still fresh in her mind. This process enabled the researcher to write the story of the session and record as many details as possible. This same process was used shortly after the second focus group session. The

researcher followed the Qualitative Data Analysis Spiral (Creswell, 2012) of: data managing; reading and memoing; describing, classifying, interpreting data into codes and themes, and representing and visualizing data. Quirkos software was used to assist in this process. The expanded notes from the focus group sessions, as well as the text from the qualitative survey item, was loaded into the software which was used to analyze, identify themes, and code the data according to the themes. The software then represented and visualized the data according to the analysis.

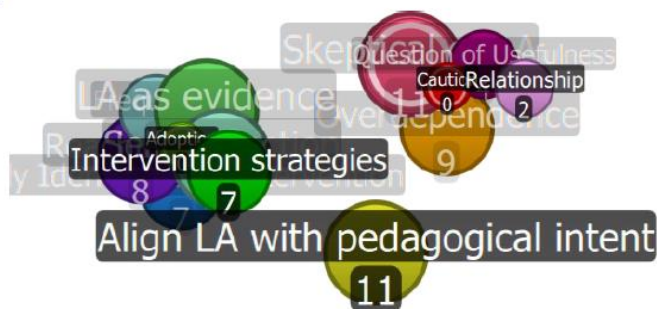
Nine themes emerged falling into the categories defined by the researcher as adoption and caution. Adoption themes include: *LA as evidence*, *reaching out*, *frequency*, *early identification/intervention*, *self-reflection*, and *align LA with pedagogical intent*. Caution themes include: *skepticism*, *fear of overdependence*, and *question of usefulness*. Figure 6 shows the summary from the final report generated by Quirkos. This figure shows all themes (“Quirks”), descriptions, parent themes, and number of codes assigned to each theme. The summary shows that *caution* and *adoption* were created by the researcher as categories for the themes and contain no direct codes themselves. They are shown as parents of other themes. It also shows a number of sub-themes such as *working the system* and *rhetorical literacy*. Three themes were not assigned to the category of *caution* or *adoption*. It was decided that *intervention strategies* and *relationship* should not constitute themes within the model because their codes could be assigned to other similar themes within the model. *Align LA with pedagogical intent* was not assigned to either category in this summary because the researcher felt that it could be assigned to either *caution*, *adoption*, or both. The model description reflects that this theme could belong to either category. Figure 7 shows the view from Quirkos.

## Quirks Summary

Quirk Title	Parent	Grandparent	Description	Author	Date	Total Codes
Caution			Expressing caution/hesitation in the use of LA	McKee	Jun 15, 2016 9:29:13 PM	0
Overdependence	Caution		The pitfall of relying too heavily on LA	McKee	Jun 15, 2016 9:50:19 PM	9
Skeptical of LA	Caution		caution against trusting to heavily in LA	McKee	Jun 15, 2016 9:36:32 PM	11
Working the System	Skeptical of LA	Caution	Students learn what these tools measure and spend time working the system rather than learning	McKee	Jun 15, 2016 9:55:22 PM	2
Rhetorical Literacy	Skeptical of LA	Caution	Use wisely	McKee	Jun 15, 2016 9:57:48 PM	4
Question of Usefulness	Caution		Are LAtools useful or appropriate?	McKee	Jun 15, 2016 9:45:41 PM	4
Adoption			embracing the use of LAin the classroom	McKee	Jun 15, 2016 9:14:12 PM	0
Early Identification/Intervention	Adoption		Using LAearly in the course to identify at-risk students and intervene before it's too late	McKee	Jun 15, 2016 9:03:37 PM	7
Reaching out	Adoption		Using LAto reach out to students so they know you notice and care about their performance	McKee	Jun 15, 2016 9:06:01 PM	8
Frequency	Adoption		How often is LAbeing consulted	McKee	Jun 15, 2016 9:09:42 PM	5
LAas evidence	Adoption		using LAto legitimize your concern for a student or to check their story	McKee	Jun 15, 2016 9:09:04 PM	11
Self-Reflection	Adoption		Using LAto reflect on your course and teaching	McKee	Jun 15, 2016 9:08:48 PM	10
Intervention strategies			Developing consistent intervention strategies	McKee	Jun 20, 2016 10:01:38 PM	7
Align LAwith pedagogical intent			Instructor must decide whether LAligns with the way their course is structured and taught	McKee	Jun 15, 2016 9:39:07 PM	11
Relationship			LACan't tell if a student is personally at-risk	McKee	Jun 22, 2016 1:28:03 PM	2
<b>TOTAL NUMBER OF CODES</b>						<b>91</b>
<b>TOTAL NUMBER OF QUIRKS</b>						<b>15</b>

**Figure 6:** Quirkos Summary

## Quirks Canvas - Primary



**Figure 7:** Quirkos View

The model is described in detail in the next section, but examples of data supporting each theme are included here. Representative data coded under the theme *LA as evidence* included:

- “She often uses CA to confirm or dispute a student’s story (ex. My computer froze up in the middle of an exam). She also feels that CA helps to stop cheating. This tool helps the instructor to see the details of what the student was doing in the system. How long they were in, what exam items they were clicking on, if they spent time writing or copied and pasted, etc. It gives the instructor insight into what they students are doing when logged in to Canvas.”
- “M. is going to use DD documentation of interactions in a grade appeal to show that the student was contacted by the instructor multiple times.”
- “At the end of the semester to confirm or dispute students who feel they didn’t get the grade they deserved.”
- “J.: uses LA to justify your concern, backup your intervention. Explain to a student that they need to improve. You have black and white number to backup what you are saying.”

Representative data coded under the theme *reaching out* included:

- “M. feels that one of the advantages of SWOSU is that it is a smaller university. Using these tools to contact students who are struggling shows them that someone notices and cares. It’s important to identify and reach out to them just for the sake of them not feeling like no one notices or cares that they are struggling.”
- “J.: Can use these tools to recognize students who are falling behind and make the student feel like are not going unnoticed.”
- “Shows the students that you are aware of what they are doing and how they are performing. Giving them a heads up early on makes them feel that they are in charge of their performance. Sometimes they may just admit that they are lazy,

but at least it is up to them how they will move forward. It also lets them know that you can identify problems.”

Representative data coded under the theme *frequency* included:

- “M. uses DD in her course 2x per week and 1x per week as an admin for the RN to BSN program.”
- “M.: once a week, maybe more if expecting something.”

Representative data coded under the theme *early identification/intervention* included:

- “W. feels that these tools are most effective early in the semester because it is important to identify which students aren’t logging in during the first week of the course. This is why instructors should make an assignment due during this time.”
- “S.: You can identify the most at-risk within the first week. Then you can see within the first 3 weeks if they are going to commit.”

Representative data coded under the theme *self-reflection* included:

- “[LA] can show instructors what level of interaction in discussions results in highest student evaluations (not too much or too little).”
- “J. uses CA for quizzes and tests for item analysis to identify bad questions, look at her own topic coverage to see where there might be room for improvement.”
- “Discussion of using LA to analyze your teaching and adjust courses based on findings (when are students actively involved, when do they check out, where are areas of improvement?)”
- “Can use it to see if there are holes in your teaching methods.”

Representative data coded under the theme *align LA with pedagogical intent* included:



- “M.: you need to know your instructors and your courses. For example, module 7 in their courses is often used as a time of working on the final project so there is not much activity. You need to know and understand the pause in this course—understand the flow.”
- “T.: you should analyze what elements of the LA tools will add value to your course. Figure out what adds value beforehand to see how to use LA in your course.”
- “Not all information through the analytics are relevant for every assignment.”
- “M. says it also depends on the desire of the faculty member. Some don’t want to use this technology and perhaps don’t need to. Some faculty have very personal relationships, can remember all the names and faces, knows when students aren’t there or are struggling. Some don’t use the LMS more than they have to.”

Representative data coded under the theme *skepticism* included:

- “In Dropout Detective, sometimes their score is not always representative of the student.”
- “Can this really identify at-risk students?”
- “Difficult to compare apples to apples with different LA tools.”
- “She questions what goes into the algorithms in LA that label students at-risk. She feels that it is important for instructors to understand what goes into the tool.”

The theme of skepticism included the sub-themes of *working the system* and *rhetorical literacy*. Representative data coded under the sub-theme *working the system* included:

- “Students might just learn to work the system like they do for everything else (you want more clicks, I’ll give you more clicks). Students log in and go away

just to log time spent. They might spend more time working the system than learning and improving.”

Representative data coded under the theme *rhetorical literacy* included:

- “She fears that faculty and admin can’t reach a ‘rhetorical literacy’ with this type of data related to student retention. She thinks they can be useful at a faculty level, but worries about the use of LA at an administrative level.”

Representative data coded under the theme *fear of overdependence* included:

- “B.’s summary of the discussion: we should be careful with the use of LA. It’s not the end-all be-all. It’s a problem in our society in general for people to want a quick-fix answer. Something that will make it all better, but that’s not how it works. There is a time and a place for LA. Let’s not be too critical or too enthusiastic.”
- “W.: LA is a tool not a weapon, but it’s only one tool in your box.”
- “D.: use LA critically.”
- “It’s too easy for instructors to over utilize or put too much stock in LA because they produce pretty shiny charts.”

Representative data coded under the theme *question of usefulness* included:

- “R. questions how much time it would take to use these tools and how much the instructor should commit to helping at-risk students based on these tools.”
- “K.: LA won’t help some students. They are simply bound to fail. They need to take the course again because they weren’t ready. Your interventions won’t help.”
- “I’m still not completely sure of the purpose on the at-risk side. If we choose to use the analytics to identify the student, how much are we, as instructors,

committing ourselves to make sure the student passes? I know that would be a personal decision, but I feel like I would be pressured to use these instruments to a certain degree.”

These representative data show how text from the focus group summaries and open-ended survey answers were analyzed and coded according to the themes identified using Quirkos software. The full Quirkos report is included in Appendix K.

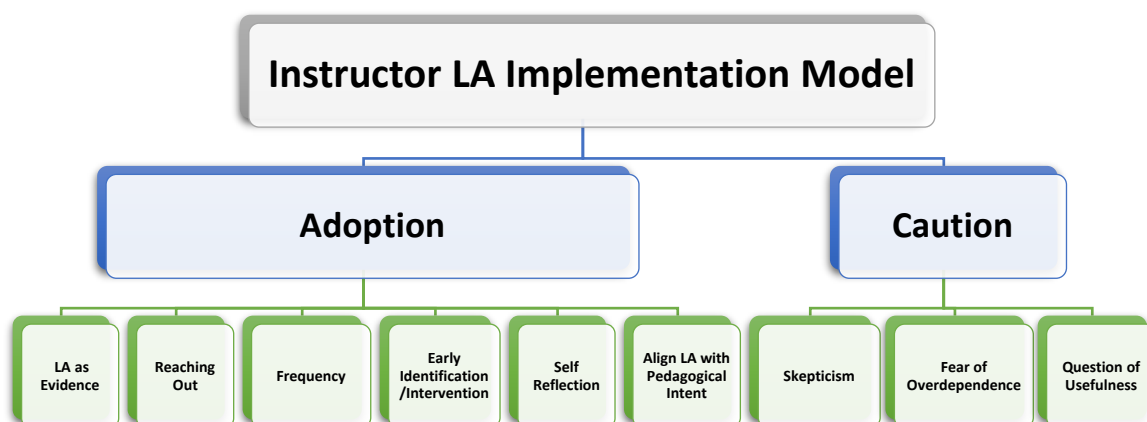
## **Phase 2: Model Construction**

Based on the review of literature and the qualitative data collected through the survey and focus group sessions, the researcher developed an instructor LA implementation model to support at-risk students. The model is meant to fill the research gap discussed in Chapter 1 by offering guidance to instructors wanting to implement LA in their courses. This model was developed based on research conducted at one university with two specific LA tools available to faculty, but it is also based on a thorough review of literature and is meant to be generalizable to a number of environments and LA tools. The model that emerged is based on the themes identified, which echoed much of what was found in the literature. It includes practical as well as conceptual guidelines for instructors wanting to implement LA in their courses and should offer guidance and support.

### *Instructor LA Implementation Model*

Based on a review of the current literature regarding LA and a needs assessment (including a survey and two focus group sessions) regarding LA implementation at SWOSU, the following instructor LA implementation model was developed (Figure 8). The first focus group session was very positive and implementation strategies were

discussed and refined. The second group expressed a very cautious attitude toward the implementation of LA. It became clear during the focus group sessions that the themes identified fell into two broad categories: adoption and caution. These contrasting attitudes reflect the literature concerning LA implementation. For example, Dringus (2012) expressed a number of cautions concerning LA and used the phrase “considered harmful,” while Wise (2014) presented an implementation model for student use of LA. Although themes fell into these two seemingly conflicting groups, the model is meant to demonstrate that both adoption and caution are part of the overall implementation process. Themes are organized according to these two categories, and practical and conceptual guidelines are presented based on these themes.



**Figure 8.** Instructor Learning Analytics Implementation Model

**Adoption:** Many instructors participating in the focus groups already used LA extensively in their courses. Others were eager to learn more and begin the implementation process. Based on the needs assessment and review of literature the

following themes emerged: LA as evidence, reaching out, frequency, early identification/intervention, self-reflection, and aligning LA with pedagogical intent.

*LA as Evidence.* It seems that many instructors appreciate that LA provides indisputable facts and information. This type of information can be used in a variety of ways, but it is a common theme that instructors appreciate the ability to look up and report hard data. For example, this information can be used to confirm or dispute a student's story if he claims computer issues prevented him from completing his work. It might also help to support an instructor if a grade is disputed because LA can track student activity as well as student/instructor communication. Instructors might also use charts, graphs, etc. from an LA tool when reaching out to a struggling student. These data can help justify instructor concern and persuade the student that there is a problem that needs to be addressed. Instructors might also benefit from their students knowing that this information is readily available. If a student knows that the instructor can see a high level of detail on student course activity, this increases accountability on the student's part. He will feel that his actions matter and someone is paying attention.

It can be very difficult for instructors to remember details regarding student activity, communication, etc. When implementing LA in a course, instructors should remember that these tools are there to support their teaching practice. When questions arise, instructors should remember to consult these tools because they often reveal more information than instructors can readily recall themselves. In addition, when contacting students regarding participation, activity, or grades, it might be helpful to include data generated by LA in that line of communication. This evidence helps students understand

that instructors are not relying solely on instincts or memory, but that specific facts and details are available.

*Reaching out.* Many instructors expressed that LA helps them to reach out to students who are struggling and can result in a better relationship. Instructors often use the information generated by LA to identify students who are struggling or falling behind, and “reach out” to these students by contacting them personally. This simple act is often enough to help students improve because it lets them know that someone notices and cares. One focus group participant said it “shows the students that you are aware of what they are doing and how they are performing. Giving them a heads up early on makes them feel that they are in charge of their performance. Sometimes they may just admit that they are lazy, but at least it is up to them how they will move forward. It also lets them know that you can identify problems.” Another said that acting on non-participation lets students know they are missed.

Instructors can use LA tools to identify students who are struggling and initiate some kind of conversation with them. Sometimes students might just need a little nudge. Often students in large or online courses feel that no one notices whether they succeed or fail, and even a few words can make a big difference. Instructors teaching large or online courses know that it is difficult to monitor the progress of so many students when instructors often do not ever meet these students face-to-face. The job is not easy. LA tools can make that job a bit easier so instructors can be more effective in reaching out.

*Frequency.* A useful strategy is to consult LA tools consistently as the course progresses. Many instructors make a habit of consulting these tools once or twice per week to see if there is any new information to act upon. This consultation provides

instructors with information on student activity in addition to what is observable from the course itself. How often these tools should be consulted depends on the course structure. What is important is to develop a schedule that works for the course and abide by it. Wise et al. (2016) stated “the frequency with which the analytics are provided or accessed as well as the schedule for reflective activity will vary depending on the context. The goal is to create a specific timing for cyclical review” (p. 12).

*Early identification/intervention.* Many instructors feel that LA tools are most beneficial early in the course because it is important to identify struggling students early when there is still time to get them back on track. One focus group participant suggested always having an assignment due during the first week of the course and using these tools to see which students are not putting that effort in right off the bat. Identifying and intervening early with these students is key. Another participant recommended identifying where the “point of no return” is in each course and being mindful as it approaches. Helping students get on track with the course before this point can increase the probability of success.

Additionally, it is important for instructors to develop consistent intervention strategies to use when acting upon the information provided by LA tools. Many instructors benefit from the use of preformatted messages. These messages can be used to reach out to struggling students, advise them on where to find help, and direct them to campus resources such as retention, tutoring, writing center, etc. These messages should by no means be restricting and should be edited and customized to whatever degree the instructor prefers, but having preformatted messages makes this kind of communication more consistent and can save instructors’ valuable time. It is also beneficial to decide

beforehand what constitutes a need for intervention and what kind of intervention is appropriate. Many instructors develop a flowchart or similar visual depiction of their policies, which helps them to decide when and how to intervene. A flowchart like this also provides consistency and saves time.

*Self-reflection.* A common theme in the literature as well as in the needs assessment is the use of LA for the purpose of self-reflection. LA can provide a wealth of information to instructors wanting to assess their course and teaching practices. Focus group participants discussed how LA can be used to analyze teaching and adjust courses based on findings (e.g., when students are actively involved, when they lack interest, and where there are areas of improvement). Using LA for test item analysis is useful to this end. Analyzing which exam questions are most frequently missed can reveal what teaching areas need more focus or perhaps might reveal some “bad questions.” One focus group participant mentioned that she uses LA to see what level of instructor discussion participation results in higher student evaluations. This helps her to identify how much participation is appropriate so as not to monopolize the conversation or have too small a presence.

Instructors wanting to implement LA in their course structure can greatly benefit from using LA as a tool of self-reflection. The information can supplement the traditional course and instructor evaluation and perhaps reveal more detailed information. This type of self-reflective activity can take place throughout the teaching and learning process, but also at the end of each semester before beginning another. Instructors can use what they learned from LA in one semester as they design and make changes to the course for the next semester.



*Align LA with pedagogical intent.* The last theme of LA adoption identified in the literature and needs assessment is that the use of LA tools must align with the instructor's pedagogical intent. These tools are not one-size-fits-all. There are some circumstances in which certain features are not useful in a course. There are even situations where LA is not useful at all in a course. Instructors must always be mindful of what is being measured and reported and whether this information is an accurate reflection of learning based on their course design. Pedagogy must drive the use of LA. One focus group participant stated, "You must analyze what elements of LA tools will add value to your course and know this before the course begins so you have a plan for how to use LA in your course." It is important for instructors to understand what is being measured by these tools and how, consider how these measures align with the course structure and pedagogy, and remember this when consulting these tools and acting on the information they provide.

Another participant noted that the use of LA also depends on the interest of the faculty member. This model is useful for faculty who desire to utilize LA, but the use of these tools should not be forced. Some instructors are not interested in these tools and feel that they can serve their students and develop relationships without the use of this type of technology. LA should only be used to supplement and assist instructors but will never be able to replace the personal connection between instructors and students.

The idea of aligning the use of LA with the instructor's pedagogical intent was discussed from a number of perspectives relating to the implementation and adoption of LA, but it was also discussed from a cautionary perspective. Many participants felt that instructors implementing LA in their courses must be wary of these tools and consider

how much weight should be placed on the information they reveal. These concerns relate to the second category of themes, which reflect an attitude of caution.

**Caution.** Much of the literature, as well as the qualitative data collected in the needs assessment, revealed a very cautious attitude towards the adoption and implementation of LA in the classroom. Many felt that these tools can be inaccurate, impersonal, or intrusive. It is common for users to be wary of new technologies, and LA is no exception. A number of themes emerged within this category such as: skepticism, fear of overdependence, and the questioning of the overall usefulness of LA.

*Skepticism.* If LA is going to be useful in a course, it is essential that the use of LA aligns with the instructor's pedagogical intent; however, many instructors question whether this can be the case. When these tools are not transparent about how they collect, analyze, and report data, instructors become skeptical as to whether the data can be trusted. The way these tools measure student success is not always representative of the students' effort and performance. In addition, different tools use different metrics so it is difficult to compare them. Transparency is essential if instructors are going to trust that the information provided by LA tools is accurate and can be acted upon. One participant noted that she wants to see exactly what measures are going into the algorithms that detect and label "at-risk" students.

Similarly, there is concern that LA is too often about the bottom line and does not take the cultural context of the students and campus into account. An example of this is that many students at SWOSU work full time, often on a family farm. These students might begin to struggle to keep up, and LA does not reflect these types of situations. LA is unable to identify students who are personally at-risk in some way rather than

academically at-risk. While LA cannot detect this level of detail regarding students' personal circumstances, they can accurately reflect symptoms of a deeper problem. One participant noted that these tools must be used critically to help instructors understand these underlying causes.

Another concern is that students may begin to understand what activity these tools measure and how they measure it, and these students may begin to “work the system.” For example, if an LA tool measures how long students are logged into the LMS, they may log in and stay logged in while working on other things and not actively engaged in the course. Another example is if an LA tool measures the number of clicks (e.g., click tracking software) students may use this to their advantage by clicking their mouse randomly to increase their participation level. One participant said that students might think “you want more clicks, I’ll give you more clicks!” Some LA tools measure student performance in relation to the performance of the class as a whole. Some participants expressed concern that students may attempt to take advantage similarly to when a class is graded on a curve. Everyone underperforms because they know their performance is measured as it relates to the class as a whole. While it is uncommon for instructors to actually assign grades based on LA data, the concern about this misuse of LA is real.

Participants also expressed the fear that LA tools may encroach on privacy in some way. Many fear that it might make students uncomfortable for instructors to have this level of detailed information, but they also fear that administration will use this information to monitor instructor performance. This fear of surveillance is closely related to the fear that these tools do not always measure performance accurately because there is

no “one-size-fits-all.” The concern is that administration will use LA destructively to monitor employees, which might create a privacy issue.

One participant mentioned that faculty and administration alike must come to a level of “rhetorical literacy” in order to make proper use of LA. Selber (2004) introduced the idea that there are different levels of literacy, which can be developed regarding the use of technology: functional literacy (computers as tools), critical literacy (computers as cultural artifacts), and rhetorical literacy (computers as hypertextual media). The participant noted, “The basic idea is functional literacy is the most basic kind of usage of technology, while rhetorical literacy requires a much more sophisticated self-awareness of the technology user. Selber (2004) argues that most users get stuck in the critical literacy stage and think that there is no other place to go, especially when it comes to using technologies responsibly and ethically.” This participant felt that users of LA tools should reach a level of rhetorical literacy in order to use LA properly, but also felt that is unlikely to happen. The main concern was that administration could inappropriately use this technology to monitor instructors without having a true understanding of the technology, the course, the instructor, or the pedagogy. Rhetorical literacy would mean that these things are critically understood which would enable users to make effective use of LA. Many participants felt that LA should be used as a tool, not a weapon.

*Fear of overdependence.* A similar theme found in the needs assessment is the fear that users will become overly dependent on these tools. The concern is that faculty and administration might put too much stock into these tools and treat them as the “end-all-be-all” solution to the problem of helping at-risk students and increasing retention. One participant noted that it is a problem in our society in general for people to want a

quick-fix answer or something that will make everything better, but that is not how it works. There is a time and a place for LA. He advised to not be too critical or too enthusiastic about the use of LA. Just as LA should be used as a tool, not a weapon, users need to remember that it is only one tool in the toolbox.

*Question of usefulness.* Finally some instructors question the overall usefulness of LA tools. Many mentioned that some students are just not prepared for a course and there are no interventions that would enable the student to succeed. One participant also questioned to what degree instructors should commit to helping the students succeed, and what should simply be left to the student. While it is ultimately up to the student to succeed in a course, instructors should also be available and willing to use whatever resources and time they have available to support students. LA tools ultimately save instructors time and act as an assistant for instructors wanting to look deeper into the level of student participation.

**Model Conclusions.** It is important to be mindful of these themes and cautious about the implementation of LA, but these concerns do not mean that LA cannot be implemented successfully when approached cautiously. Instructors should remember that LA is a powerful tool, but should not be used as a weapon, and this tool is only one in the toolbox. LA is not a quick fix answer that will ease all of the retention problems faced by instructors, but it can serve to assist them in their efforts to support students, which is the ultimate goal. These tools must be used critically while seeking to reach a level of rhetorical literacy concerning this new technology, which can greatly benefit students and instructor practice if implemented appropriately and effectively.

### **Phase 3: Model Validation**

The researcher recruited three participants from the focus group session to participate in the Delphi panel validation process. This enabled them to assess whether the model addresses the needs and opinions voiced during the focus group session. Two of the Delphi panel participants were those who validated the instruments for this study. The first participant was the Director of CETL which provides support, resources, and services that enable faculty to achieve excellence, integration, and satisfaction in distance and eLearning, teaching, and classroom technology. The director also has many years of teaching experience at SWOSU in the department of business and computer science. The second Delphi panel participant is a faculty member in the nursing department who also serves as the RN to BSN coordinator and was a champion for implementing Dropout Detective in her program. The third participant is a faculty member in the English department, has served on the Distance and eLearning Council at SWOSU for several years, and was instrumental to the focus group sessions. This panel represented members of both focus group sessions.

After agreeing to participate, the panel was sent an initial email (Appendix I) with a participation letter (Appendix J) attached which served a statement of informed consent. The participants were asked to respond within two weeks with feedback. They were asked to complete a questionnaire to assess whether the model adhered to what was discussed during the focus group as well as the usability of the model according to the Rubin and Chisnell's (2008) attributes.

For the most part, the Delphi panel found the model to be complete, useful, efficient, effective, and learnable. They provided positive feedback regarding the themes

identified and the overall usability of the model. Some of the panel's comments are included below:

- “The model would be useful in reaching out to students who are struggling and need mentoring.”
- “I believe the model is learnable, if the instructor cares about the students and wants them to succeed in their class, they would go over and beyond to understand and implement the model.”
- “I agree with the guidelines. I think your guidelines capture the importance of reflective practices for instructors and administrators in using LA. I especially like the notion of LA as a ‘tool, not a weapon.’”
- “It offers a theoretical perspective and reasons for implementation. Some folks might expect more detailed, practical, day-to-day or week-to-week explanations of how to use LA, but I think being that detailed defeats the concept of flexibility you discuss in your model.”
- This model reflects the concerns and suggestions of multiple instructors and, therefore, has captured many different perspectives to consider.”
- “I would agree with the model. In practice, I have also seen the dichotomy of caution vs. embracing/adopting any new technology. This resonates with most change theory I've read. The model is representative of what we discussed in my group (focus group 1) in terms of adoption. I especially found the piece about early identification and accountability to be true.”

- “I do agree that early identification is essential, and that using the tools for self-reflection is key, both for students and faculty. If we ask our students to reflect on how they can improve, shouldn't we do the same?”

The panel gave three recommendations. The first recommendation was adding need for transparency on how data are gathered to the caution section of the model. The researcher responded that this is detailed under the theme of *skepticism* and asked if the panel member felt that *need for transparency* should constitute a separate theme. After discussion, it was decided that should remain under the theme of *skepticism* and no revisions were required. The second recommendation was that the model should be arranged into an acronym to make it more learnable to the user. After further discussion it was decided that the themes could not be arranged into a useful acronym and this was not necessary. No revisions were required. The third suggestion was stated as follows:

*Maybe this is outside of the realm of your focus, but it would have been nice to see a little more discussion of student access to LA information and how students might be able to use that data on their own, without instructor intervention (for example, if LA data is available to students when they log into a course, could that make them more likely to do the work?). Maybe this is implied in the discussion of intervention, but I was hoping to see the discussion of student use of LA data teased out a bit more.*

The panel members were not initially sent the entire dissertation proposal, but just the model. The researcher discussed with this panel member that this study is meant to focus on instructor LA use because student LA implementation models have already been developed and exist in the literature. The panel members were sent the entire dissertation



proposal for review in response to this discussion. It was decided that this panel member's suggestion was very good, but out of the scope of this study. No revisions were required. After receiving feedback and addressing all issues, the researcher sent a final email to the panel and received final approval of the model.

### **Summary of Results**

This study was designed to identify the needs of stakeholders regarding the implementation of LA in the classroom in order to design an instructor LA implementation model to support at-risk students. The model would include conceptual and practical guidelines and should be generalizable to a number of environments and LA tools.

An online survey was designed and administered to collect qualitative and quantitative data regarding demographics, prior use and perceptions of LA, LA efficacy, and willingness to participate in focus group. The quantitative survey data established the need for and applicability of such a model. Survey and focus group qualitative data were collected regarding LA use and what should be included in such a model. These data were analyzed and results were recorded.

Next, a model was developed based on the literature review and needs assessment. The qualitative data from the survey open-ended question and focus group notes were analyzed. The model was developed based on the themes that emerged from these data which echoed the themes from literature review. Last, the model was presented to a Delphi panel for validation. The panel required no revisions and the model was approved. This chapter describes the data analysis, results, and resulting validated model.

## Chapter 5

### Conclusions, Implications, Recommendations, and Summary

The purpose was to develop and validate an instructor learning analytics (LA) implementation model to support at-risk students. This model was developed to enable instructors to effectively implement whatever LA tools they have available in their courses. Although based on the research conducted at a single institution using only two available LA tools, the model is intended to be generalizable to a number of environments and LA tools. A thorough review of the existing literature on LA guided the development of the model. This review included a review of LA tool research, LA model research, LA implementation research, and design and development research methods. Quantitative and qualitative data were collected through survey and focus group research methods to identify the stakeholder needs and perception regarding LA. One open-ended survey question and the focus group discussions were meant to gather data regarding the requirements and design of such a model.

The review of literature and needs assessment informed the design of the model presented here. The model was reviewed and validated using a Delphi panel of LA experts at SWOSU. Chapter 5 presents conclusions, implications, and recommendations for future research and application. The chapter concludes with a summary of the research study.

#### **Conclusions**

The following conclusions are organized by each of the five research questions and the corresponding results from the review of the literature and data analysis.

Research question 1: *What LA tools and models are currently available to instructors, how are they using these tools and models to support teaching and learning, and what are the benefits and limitations of such LA tools and models?*

A literature review was conducted to identify relevant information to inform the preliminary design of the model. Literature was reviewed regarding LA tool research, LA model research, and LA implementation research. Studies that implemented design and development research methods were also reviewed to inform the methodological design.

Product and tool research involves a detailed description, analysis, and evaluation of the design and development of specific products to understand conditions, which facilitate their use. In contrast, model research is the study of model development, validation, or use, which results in new procedures or models and conditions, which facilitate their use. The difference is that product and tool research results in context-specific conclusions while model research promises results and conclusions, which are more generalizable to the entire field (Richey & Klein, 2007). Essentially, the first category of LA research focuses on the development of tools, and the second category focuses on developing models or frameworks, which facilitate the use of such tools. The majority of past research on the topic of LA focuses on tool development; however, model and implementation research is becoming more prevalent in recent literature.

A number of less relevant models were identified such as LA tool development models (Greller & Drachsler, 2012; Martinez-Maldonado et al., 2015; Scheffel et al., 2014) and an ethical model (Swenson, 2014). In addition, models regarding LA implementation were identified which are more relevant to this study. Two very useful models were presented that were specific to student LA implementation (Wise, 2014;

Wise et al., 2016). Two studies presented a useful and relevant administrative LA implementation models (Ferguson et al., 2014; West, Heath, & Huijser, 2016).

After reviewing the model research there remained a gap in the literature regarding instructor implementation of LA. Lockyer et al. (2015) addressed this issue in part by focusing on how learning design can inform the use of LA, but their conclusions are difficult to generalize to a variety of learning situations. A number of other studies (Jayaprakash, et al., 2014; Rodríguez-Triana et al., 2015; van Leeuwen et al., 2014; van Leeuwen et al., 2015) addressed different aspects of instructor implementation, but offered no model to support instructors in their efforts. The review identified a gap in the literature regarding instructor LA implementation model research. The review also informed the design of the preliminary model. The review of research regarding students, administration, and faculty implementation of LA was very useful in designing this model. Wise et al. (2016), West and Huijser (2016), and Dringus (2012) were some of the most relevant studies to this end.

Research question 2: *What needs to be considered to design an effective model to guide instructors in LA implementation to support at-risk students?*

A needs assessment was conducted to identify stakeholder needs regarding LA implementation. Stakeholders included instructors, online learning administrators, and online learning committee members. The survey results indicated that prior use and perceptions of LA are mostly positive, but the least positive response was to the item: *I am able to use the information generated by learning analytics to help students get back on track*. This result indicates that respondents feel that they might lack the ability to effectively utilize LA to benefit students, demonstrating the need for the model

developed through this study which supports instructors in implementing LA to identify and help at-risk students. Survey results also indicated that there is a desire for the model presented here. This is evident by the percentage of participants who responded “agree” with the following survey items: *I will be able to effectively incorporate learning analytics into my classroom with training* (64.7%), *I could use guidance on how to effectively use the data generated by learning analytics to help at-risk students* (66.67%), *I would use learning analytics more effectively if I could reference a model that showed me how to use/apply information generated by such tools* (56.86%), and *such a model would be useful to me* (56.86%).

An open-ended survey question and focus group data were analyzed to identify themes relevant to the design of an instructor implementation model. Items discussed include: How instructors currently use LA tools in courses; when during the learning process do instructors access and use LA tools; how instructors feel that these tools benefit themselves or their students; how LA tools enable them to identify and help at-risk students; what type of guidance would enable instructors to utilize LA tools more effectively; what do instructors need to be able to know or do in order to use LA tools to identify at-risk students and implement strategies to help them succeed; what personal guidelines, practices, or procedures do instructors follow regarding the use of LA in their courses, what conceptual guidelines should be included in such a model; and what practical guidelines that should be included in such a model. Based on this discussion, themes were identified and data were coded according to these themes.

Research question 3: *How can stakeholder needs inform the design of such a model?*

The literature review and needs assessment were used to develop an LA model to guide instructors in the development of interventions for at-risk students. Qualitative data from the open-ended survey item and focus group sessions informed the design of the model. Themes emerged and data were coded according to these themes. The researcher found that some of the discussion and resulting themes echoed themes found in the literature. The themes were categorized into those that reflected an attitude of welcome adoption of LA and those that expressed an attitude of caution toward LA.

LA adoption themes include: LA as evidence, reaching out, frequency, early identification/intervention, self-reflection, and aligning LA with pedagogical intent. *LA as evidence* theme emerged as participants discussed how they like to refer to LA tools to validate their concerns. For example, this information can be used to confirm or dispute a student's story if he claims computer issues prevented him from completing his work. Instructors might also use charts, graphs, etc. from an LA tool when reaching out to a struggling student. These data can help justify instructor concern and persuade the student that there is a problem that needs to be addressed. *Reaching out* theme emerged as participants discussed how LA helps them to reach out to students who are struggling and can result in a better relationship. *Frequency* refers to the strategy of consulting LA tools consistently as the course progresses. *Early identification/intervention* theme emerged as participants discussed the idea that LA tools are most beneficial early in the course because it is important to identify struggling students early when there is still time to get them back on track. The theme of intervention also refers to the importance of instructors developing consistent intervention strategies to use when acting upon the information provided by LA tools. The theme of *self-reflection* emerged as participants

discussed how LA can be used to analyze teaching and adjust courses based on findings (e.g., when students are actively involved, when they lack interest, and where there are areas of improvement). Last, the theme of *align LA with pedagogical intent* emerged as participants discussed the idea that instructors must always be mindful of what is being measured and reported and whether this information is an accurate reflection of learning based on their course design.

LA caution themes include: skepticism, fear of overdependence, and the questioning of the overall usefulness of LA. *Skepticism* theme emerged as participants discussed an overall attitude of skepticism and mistrust of such tools. The need for transparency of such tools, the idea that LA can be an invasion of privacy, the fear of students “working the system,” and the need for rhetorical literacy with these technologies were all part of this overall skeptical theme. An important note is that LA should be used as a tool, not a weapon. The *fear of overdependence* also emerged as a theme as participants noted that they were concerned that faculty and administration might put too much stock into these tools and treat them as the “end-all-be-all” solution to the problem of helping at-risk students and increasing retention. Last, the *question of usefulness* emerged as a theme as some participants questioned to what degree instructors should commit to helping the students succeed, and what should simply be left to the student.

Research question 4: *How do instructors perceive the effectiveness and efficiency of the proposed LA model?*

A Delphi panel was used to validate the model. The panel reviewed the model in terms of how well it adhered to what was discussed in the focus groups as well as the

overall usability of the model (i.e. usefulness, efficiency, effectiveness, and learnability). The panel provided positive feedback regarding the themes identified and the overall usability of the model. They felt that the model was useful, efficient, effective, and learnable. These sentiments are reflected by comments by Delphi panel comments such as:

“The model would be useful in reaching out to students who are struggling and need mentoring.”

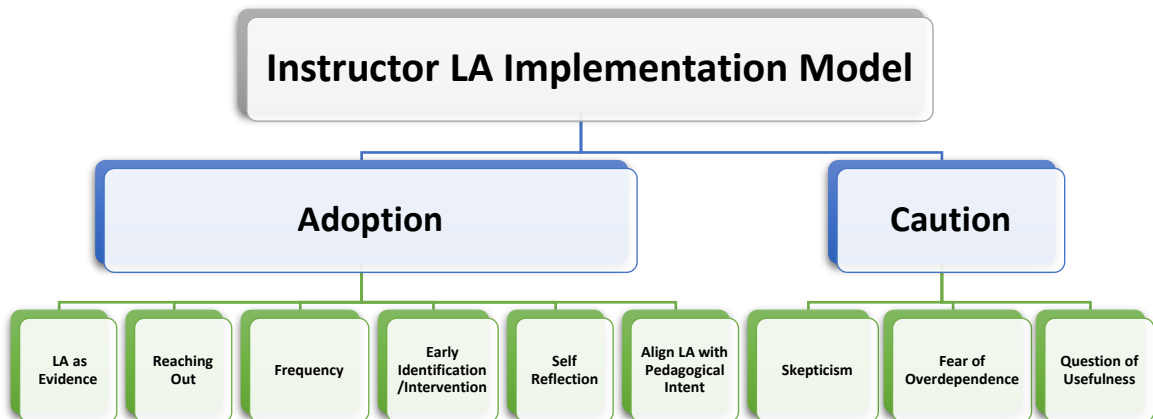
“I believe the model is learnable, if the instructor cares about the students and wants them to succeed in their class, they would go over and beyond to understand and implement the model.”

The following section includes the suggestions for improvement.

Research question 5: *What modifications are needed to improve the proposed LA model?*

The following three recommendations were made by the Delphi panel: adding need for transparency on how data is gathered to the caution section of the model; the model should be arranged into an acronym to make it more learnable to the user; include more discussion of student access to LA information and how students might be able to use that data on their own, without instructor. After discussion regarding these three issues, it was decided by the Delphi panel and researcher that no revisions were necessary and the panel provided final approval of the model. Figure 9 depicts the approved model.





**Figure 9.** Final Instructor Learning Analytics Implementation Model

### Implications

This study helped to identify the needs of instructors wanting to implement LA in their courses. The results informed the design of an instructor LA implementation model to support at-risk students. The model was validated internally by a panel of experts. The final model includes practical and conceptual guidelines regarding the use of LA and is meant to be generalizable to a number of environments and LA tools.

This study also contributed to the body of knowledge of design and development research by providing an example of a successful model construction and validation study. This study could serve as a template for future researchers planning to carry out a design and development study. The coordination between the researcher, faculty participants, university administrators, dissertation advisors, dissertation committee members, and internal review boards depict how a study involving so many moving parts can be carried out smoothly and successfully.

## **Recommendations**

This section includes two categories of recommendations. First, recommendations for future research are presented. Second, recommendations for professional practice in relation to the implementation model are presented.

### *Future Research*

This study could be expanded to include external validation of the model presented here. Using the instructor LA implementation model from this study, researchers can work with an institution of higher education to study the impact of the model's use (Richey & Klein, 2007). This type of study would also measure the model's usability (usefulness, effectiveness, efficiency, and learnability) in a setting external to the one where the model was developed.

The model could also be studied in relation to student retention. Researchers could seek to study how instructors' use of this model to implement LA in their courses might affect course grades and student persistence. Researchers could also study the effect of the model's use on the overall teaching and learning process.

### *Recommendations for Practice*

The first recommendation is that instructors at SWOSU wanting to implement available LA tools and technologies (i.e. Dropout Detective and/or Canvas Analytics) use the model presented here to support their efforts. Review of this model will enable instructors to better understand how to effectively implement LA in their courses. The model demonstrates the benefits of LA and practical and conceptual guidelines to guide LA implementation. It also includes some areas of caution that instructors should be aware of so as not to fall into common pitfalls in the implementation of LA. The model

should be made available to SWOSU instructors through the Center for Excellence in Teaching and Learning, and a workshop should be offered by the researcher for interested faculty.

Second, since the model was designed to be generalizable to a number of environments, instructors at other universities can use the model to implement LA in their course. This model is meant to be something that can be adopted and used by individual instructors in individual courses. The institution as a whole does not have to implement this model as a standard of practice. Instructors can use this model at will, and it should be used only by those who have an interest and desire to do so. The model and supporting research will be presented at the 2016 Online Learning Consortium Accelerate Conference, which will make this model available to a large group of instructors who might be interested in LA implementation. The researcher will make this model available to any interested parties who might put it to use in order to improve their teaching practices.

### **Summary**

LA research has focused on the development, testing, and validation of LA tools and products. Fewer studies address how to actually implement the use of LA in practice. Wise (2014) and Wise et al. (2016) offered models on how LA can be implemented when the tools are available to the students. West and Huijser (2016) presented a useful model for implementing LA, but focused on administrative implementation. Lockyer et al. (2013) presented research on instructor use of LA, but did not present a useful model of how instructors can effectively implement it. There is limited evidence-based research on instructor LA implementation. This study addresses this gap by constructing and

validating an instructor LA implementation model. This goal was achieved by assessing and analyzing the needs of instructors regarding the use of LA.

The following research questions guided the study:

1. What LA tools and models are currently available to instructors, how are they using these tools and models to support teaching and learning, and what are the benefits and limitations of such LA tools and models?
2. What needs to be considered to design an effective model to guide instructors in LA implementation to support at-risk students?
3. How can stakeholder needs inform the design of such a model?
4. How do instructors perceive the effectiveness and efficiency of the proposed LA model?
5. What modifications are needed to improve the proposed LA model?

Design and development research methods (Richey & Klein, 2007) were implemented in the following three phases:

*Phase 1: Literature Review*

The researcher reviewed the literature in order to identify the current state of the body of knowledge regarding LA tools, models, and implementation. This phase also included a brief survey of design and development research studies that were useful in guiding the research design.

*Phase 2: Needs Assessment*

A needs assessment survey was used to gain a general sense of how instructors were using LA tools and identify gaps in their knowledge and skills pertaining to these tools. Following the survey, a subset of participants participated in one of two focus

group sessions that were designed to collect more detailed information about stakeholder needs. Results from the survey and focus group, along with relevant information from the review of the literature, were used to construct a preliminary LA implementation model.

*Phase 3: Model Construction and Validation*

Once the literature review and needs assessment were complete, the researcher used the information collected during these phases to construct the instructor LA implementation model. The model was based on themes that emerged during the focus group sessions, which echoed much of what was found in the research literature. The themes fell into the categories of LA adoption (LA as evidence, reaching out, frequency, early identification/intervention, self-reflection, and align LA with pedagogical intent) and caution (skepticism, fear of overdependence, and question of usefulness).

The model was presented to a Delphi panel consisting of focus group participants who are considered LA experts at SWOSU. The panel reviewed the model for how well it adhered to what was discussed during the focus group sessions, as well as the completeness, usefulness, effectiveness, efficiency, and learnability of the model. Following a discussion regarding a few recommendations, the model was approved with no revisions necessary. The final validated instructor implementation model included practical and conceptual guidelines for instructors wanting to implement LA in their courses and that can be generalized to a number of environments and LA tools.

## Appendix A

### Needs Assessment Survey

## Learning Analytics Needs Assessment Survey

### Welcome

**This survey is divided into five sections and should take approximately 10-15 minutes to complete.**

**This survey has been developed to identify the needs of faculty regarding the use of learning analytic tools (such as Canvas Analytics or Dropout Detective) to support at-risk students. Learning analytics is defined as the measurement, collection, analysis, and reporting of data about learners and their contexts, for the purposes of understanding and optimizing learning and the environments in which it occurs. Please consider your use of Canvas Analytics, Dropout Detective, or other similar tools you may have used when answering the questions below.**

**Learning Analytics Needs Assessment Survey****Demographic Information****1. Age**

- <18
- 18 - 24
- 25-34
- 35-44
- 45-54
- 55+
- I prefer not to say

**2. Gender**

- Male
- Female
- I prefer not to say

**3. In what discipline do you teach?****4. How long have you taught online courses?**

- <5 years
- 5-10 years
- 10+ years
- Not Applicable



## Learning Analytics Needs Assessment Survey

### Prior Use and Perceptions

5. I use learning analytic tools often.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. Learning analytic tools are beneficial in my course/program/university.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. I am able to use the information generated by learning analytics to identify students who may be at-risk.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. I am able to use the information generated by learning analytics to help students get back on track.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. The use of learning analytics results in better learning outcomes for my students.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10. I use learning analytics effectively to help at-risk students.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Learning Analytics Needs Assessment Survey

### Efficacy

11. Choose the statement that most resembles your attitude toward incorporating learning analytics in your classroom:

- I am able to effectively incorporate learning analytics into my classroom
- I will be able to effectively incorporate learning analytics into my classroom with training
- I don't think I'll be able to effectively incorporate learning analytics into my classroom

12. I could use guidance on how to effectively use the data generated by learning analytics to help at-risk students.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

13. I would use learning analytics more effectively if I could reference a model that showed me how to use/apply information generated by such tools.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

14. Such a model would be useful to me.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Learning Analytics Needs Assessment Survey****Model Construction**

15. What additional information or training would enable you to use learning analytic tools (e.g., Canvas Analytics or Dropout Detective) more effectively?

**Learning Analytics Needs Assessment Survey****Focus Group Participation**

16. Would you be willing to participate in a focus group to further identify what needs to be considered in the development of a model to guide instructors in the effective implementation of learning analytics to support at-risk students?

yes

no

**Learning Analytics Needs Assessment Survey****Contact Information**

17. If you are willing to participate in the focus group, please provide your name and contact information below so that I may follow up with you.

**Name****Email Address****Phone Number**

## Appendix B

### Needs Assessment Focus Group Protocol

### **Learning Analytics Focus Group Protocol**

The purpose of this focus group is to identify the needs of faculty regarding the use of learning analytic tools (such as Canvas Analytics or Dropout Detective) to support at-risk students. Learning analytics is defined as the measurement, collection, analysis, and reporting of data about learners and their contexts, for the purposes of understanding and optimizing learning and the environments in which it occurs. Please consider your use of Canvas Analytics, Dropout Detective, or other similar tools you may have used when answering the questions below.

1. How do you currently use LA tools (Dropout Detective) in your online courses?
2. When during the learning process (i.e. semester) do you access and use LA tools?
3. How do you feel that these tools benefit you or your students?
4. How do LA tools enable you to identify and help at-risk students?
5. What type of guidance would enable you to utilize LA tools more effectively?
6. What do you need to be able to know or do in order to use learning analytics tools (e.g., Dropout Detective) to identify at-risk students and implement strategies to help them succeed
7. Do you have any personal guidelines, practices, or procedures you follow regarding the use of LA in your courses?
8. What are some conceptual guidelines that should be included in such a model?
9. What are some practical guidelines that should be included in such a model?

## Appendix C

IRB Approval from Nova Southeastern University





MEMORANDUM

To: **Holly McKee**  
**College of Engineering and Computing]**

From: **Ling Wang, Ph.D.,**  
**Center Representative, Institutional Review Board**

Date: **February 5, 2016**

Re: **IRB #: 2016-27; Title, "The Construction and Validation of an Instructor Learning Analytics Implementation Model to Support At-Risk Students"**

---

I have reviewed the above-referenced research protocol at the center level. Based on the information provided, I have determined that this study is exempt from further IRB review under **45 CFR 46.101(b) (Exempt Category 2)**. You may proceed with your study as described to the IRB. As principal investigator, you must adhere to the following requirements:

- 1) **CONSENT:** If recruitment procedures include consent forms, they must be obtained in such a manner that they are clearly understood by the subjects and the process affords subjects the opportunity to ask questions, obtain detailed answers from those directly involved in the research, and have sufficient time to consider their participation after they have been provided this information. The subjects must be given a copy of the signed consent document, and a copy must be placed in a secure file separate from de-identified participant information. Record of informed consent must be retained for a minimum of three years from the conclusion of the study.
- 2) **ADVERSE EVENTS/UNANTICIPATED PROBLEMS:** The principal investigator is required to notify the IRB chair and me (954-262-5369 and Ling Wang, Ph.D., respectively) of any adverse reactions or unanticipated events that may develop as a result of this study. Reactions or events may include, but are not limited to, injury, depression as a result of participation in the study, life-threatening situation, death, or loss of confidentiality/anonymity of subject. Approval may be withdrawn if the problem is serious.
- 3) **AMENDMENTS:** Any changes in the study (e.g., procedures, number or types of subjects, consent forms, investigators, etc.) must be approved by the IRB prior to implementation. Please be advised that changes in a study may require further review depending on the nature of the change. Please contact me with any questions regarding amendments or changes to your study.

The NSU IRB is in compliance with the requirements for the protection of human subjects prescribed in Part 46 of Title 45 of the Code of Federal Regulations (45 CFR 46) revised June 18, 1991.

Cc: **Marti Snyder, Ph.D.**

## Appendix D

IRB Approval from Southwestern Oklahoma State University



The focus is you.

February 19, 2016

Ms. Holly McKee  
Department of Business and Computer Science

Re: IRB-PHS Application

Dear Ms. McKee,

The Protection of Human Subjects Committee, through expedited review and with submitted revisions, has approved your research entitled:

"The Construction and Validation of an Instructor Learning Analytics Implementation Model to Support At-Risk Students".

It is the responsibility of the researcher to notify the committee and submit any modifications to the study protocol prior to implementation. It is also the responsibility of the researcher to submit an annual report if the study extends past a year and a final report upon completion of the protocol. IRB FORM # HS-3 is provided on the SWOSU web site for your use in completing annual and final reports. For institutional compliance and auditing purposes, you are required to maintain all records pertaining to your conducted research including any informed consent forms for three years after completion of the research. For funded research, consult the time required for retention of records by the funding agency. (SWOSU disposition policies should be used when disposing of research records.) Annual reports must be received and approved by the PHSC by the anniversary date of the original approval.

The committee wishes you much success with the study.

Sincerely,

A handwritten signature in black ink that reads "Michael Wolff, Ph.D.".

Michael Wolff, Ph.D.  
Chair, IRB-PHS

cc: Dr. Ken Rose, Dean, College of Professional and Graduate Studies  
Mr. Mark Lumpkin, Chair, Department of Business and Computer Science  
Office of Sponsored Programs

## Appendix E

### Email Sent to All Potential Participants

Dear Colleagues,

I am writing to you to request your participation in a survey to support my dissertation research as part of the Ph.D. program in Information Systems at Nova Southeastern University (NSU). I am conducting a study to develop an instructor learning analytics (LA) implementation model to support at-risk students. The purpose of this model is to guide instructors in implementing LA tools (e.g., Dropout Detective or Canvas Analytics) in their courses.

In this study, you will be asked to complete a survey and, if interested, participate in a later focus group. Your participation in the survey will take approximately 10-15 minutes, and the focus group should take about 60 minutes.

There are minimal risks to you. All information will be handled in a strictly confidential manner. However, some information will be extracted solely for the purpose of identifying demographics of the participants (e.g., age and gender).

Your participation in this survey is strictly voluntary. Please read the detailed participation letter/statement of informed consent attached to this email. By clicking on the link below and completing the survey you indicate your consent to participate. You may withdraw from this survey at any time by exiting the survey. There is no penalty for refusing to participate in the survey.

The deadline to complete the survey is **Friday, March 25, 2016**. I'll send a reminder a week from today (after Spring Break). The survey can be found by clicking on the following link:

[https://www.surveymonkey.com/r/learning\\_analytics\\_needs\\_a\\_sessment\\_survey](https://www.surveymonkey.com/r/learning_analytics_needs_a_sessment_survey)

Thank you,

Holly McKee, MS, RHIA  
Instructor  
Department of Business and Computer Science  
Everett Dobson School of Business and Technology  
Southwestern Oklahoma State University

Stafford 307  
580-774-3049  
holly.mckee@swosu.edu

## Appendix F

### Survey Participation Letter



NOVA SOUTHEASTERN UNIVERSITY  
College of Engineering and Computing

*Title of Study: The Construction and Validation of an Instructor Learning Analytics Implementation Model to Support At-Risk Students*

Principal investigator  
Holly McKee, MS, RHIA  
100 Campus Dr.  
Weatherford, OK 73096  
580-774-3049

Co-investigator  
Dr. Marti Snyder, Ph. D.  
3301 College Avenue  
Fort Lauderdale, Florida 33314-779  
(954) 262-2074

Institutional Review Board  
Nova Southeastern University  
Office of Grants and Contracts  
(954) 262-5369/Toll Free: 866-499-0790  
[IRB@nsu.nova.edu](mailto:IRB@nsu.nova.edu)

Site Information:  
Southwestern Oklahoma State University  
100 Campus Dr., Weatherford, OK 73096

**Description of Study:** Holly McKee is a doctoral student at Nova Southeastern University engaged in research for the purpose of satisfying a requirement for a Doctor of Philosophy degree. The purpose of this study is to develop and validate a model to guide instructors in the implementation of learning analytics tools to support academically at-risk students with the purpose of improving learning outcomes. Using design and development research methods, the researcher will construct and validate a model internally to enhance the use of learning analytics by instructors by enabling them to better take advantage of available technologies to support teaching and learning in online and blended learning environments.

If you agree to participate, you will be asked to complete the survey linked from this letter. This survey will help the researcher identify views and opinions regarding the use of learning analytics tools. The data from this survey will be used to develop a model to support instructor use of learning analytic tools to support academically at-risk students. The survey will take approximately fifteen minutes to complete.

**Risks/Benefits to the Participant:** There is minimal risk to you for participating, and you may elect to discontinue the survey at any time without any danger of retaliation from the researcher or the college. There are no direct benefits to you for taking part in this research study. However, the college may elect to use the final model as the basis for implementing instructor learning analytics tools. If you have any concerns about the risks/benefits of participating in this study, you can contact the investigators and/or the university's human research oversight board (the Institutional Review Board or IRB) at the numbers listed above.

**Costs and Payments to the Participant:** There is no cost for participation in this study. Participation is voluntary and no payment will be provided.



**Confidentiality:** After completion of the study, all data collected will be kept for a minimum of 36 months as required by NSU. Records will be kept by the researcher and the Institutional Research Department in locked cabinets or encrypted and password protected electronic devices. All information obtained in this study is strictly confidential unless disclosure is required by the law. However, NSU IRB or the dissertation chair/thesis adviser to the researcher may review research records as needed. Your name will not be used in the reporting of information in publications or conference presentations.

**Participant's Right to Withdraw from the Study:** You have the right to refuse to participate in this study and the right to withdraw from the study at any time without penalty.

**I have read this letter and I fully understand the contents of this document and voluntarily consent to participate. All of my questions concerning this research have been answered. If I have any questions in the future about this study they will be answered by the investigator listed above or his/her staff.**

**I understand that the completion of this survey implies my consent to participate in this study.**



## Appendix G

### Email Sent to Potential Focus Group Participants

Dear Colleagues,

You are receiving this email because you indicated your willingness to participate in a focus group as part of the research study entitled: *The Construction and Validation of an Instructor Learning Analytics Implementation Model to Support At-Risk Students*. Thank you for your willingness to participate! Please click on the Doodle link below to indicate your availability. I will review participant availability and select a time which will result in maximum participation. I know it seems to get busier the later we get in the semester, so I'm going to suggest some times next week. I'll send out another Doodle for the following week if necessary.

[Click Here to Complete the Doodle Poll](#)

I look forward to meeting with you to discuss your needs and opinions regarding the use of learning analytic tools in your classroom.

Thanks again,

Holly McKee, MS, RHIA  
Instructor  
Department of Business and Computer Science  
Everett Dobson School of Business and Technology  
Southwestern Oklahoma State University

Stafford 307  
580-774-3049  
holly.mckee@swosu.edu

## Appendix H

### Focus Group Consent Form



Consent Form for Participation in the Research Study Entitled: *The Construction and Validation of an Instructor Learning Analytics Implementation Model to Support At-Risk Students*

Funding Source: None.

IRB protocol #

Principal investigator  
Holly McKee, MS, RHIA  
100 Campus Dr.  
Weatherford, OK 73096  
580-774-3049

Co-investigator  
Dr. Marti Snyder, Ph. D.  
3301 College Avenue  
Fort Lauderdale, Florida 33314-779  
(954) 262-2074

For questions/concerns about your research rights, contact:  
Human Research Oversight Board (Institutional Review Board or IRB)  
Nova Southeastern University  
(954) 262-5369/Toll Free: 866-499-0790  
[IRB@nsu.nova.edu](mailto:IRB@nsu.nova.edu)

Site Information:  
Southwestern Oklahoma State University  
100 Campus Dr., Weatherford, OK 73096

**What is the study about?**

Holly McKee is a doctoral student at Nova Southeastern University engaged in research for the purpose of satisfying a requirement for a Doctor of Philosophy degree. The purpose of this study is to develop and validate a model to guide instructors in the implementation of learning analytics tools to support academically at-risk students with the purpose of improving learning outcomes. Using design and development research methods, the researcher will construct and internally validate a model to enhance the use of learning analytics by instructors by enabling them to better take advantage of available technologies to support teaching and learning in online and blended learning environments.

**Why are you asking me?**

You are being asked to participate because you are a faculty member who uses the learning analytics tools available at SWOSU, a member of the Excellence in Teaching and Learning Committee, or an administrator who holds a stake in online learning and learning analytics use at SWOSU. In addition, after completing the survey you have also expressed interest in participating in a *focus group*.

Initials: \_\_\_\_\_ Date: \_\_\_\_\_

Page 1 of 3



**What will I be doing if I agree to be in the study?**

If you agree to participate in the focus group, the researcher will coordinate a meeting with all those participants who expressed interest. At the meeting, the researcher will guide a semi-structured discussion related to your views and opinions regarding the construction of a model to support instructor use of learning analytics tools using a pre-developed set of questions. No specific restrictions will be in place for the discussions. The focus group will consist of approximately five to ten participants. The focus group sessions will not be video or voice recorded. The focus group session should last approximately 60 minutes.

**What are the dangers to me?**

There is minimal risk to you for participating, and you may elect to remove yourself from the focus group at any time without any danger of retaliation from the researcher or the college.

**Are there any benefits to me for taking part in this research study?**

There are no direct benefits to you for taking part in this research study. However, the college may elect to use the final model as the basis for implementing instructor learning analytics tools.

**Will I get paid for being in the study? Will it cost me anything?**

There are no costs to you or payments made for participating in this study.

**How will you keep my information private?**

After completion of the study, all data collected will be kept for a minimum of 36 months as required by NSU. Records will be kept by the researcher and the Institutional Research Department in locked cabinets or encrypted and password protected electronic devices. All information obtained in this study is strictly confidential unless disclosure is required by the law. However, NSU IRB or the dissertation chair/thesis adviser to the researcher may review research records as needed.

**What if I do not want to participate or I want to leave the study?**

You have the right to leave this study at any time or refuse to participate. If you do decide to leave or you decide not to participate, you will not experience any penalty or loss of services you have a right to receive. If you choose to withdraw, any information collected about you before the date you leave the study will be kept in the research records for 36 months from the conclusion of the study but you may request that it not be used.

**Other Considerations:**

If significant new information relating to the study becomes available, which may relate to your willingness to continue to participate, this information will be provided to you by the investigators.

Initials: \_\_\_\_\_ Date: \_\_\_\_\_

Page 2 of 3



**Voluntary Consent by Participant:**

By signing below, you indicate that

- this study has been explained to you
- you have read this document or it has been read to you
- your questions about this research study have been answered
- you have been told that you may ask the researchers any study related questions in the future or contact them in the event of a research-related injury
- you have been told that you may ask Institutional Review Board (IRB) personnel questions about your study rights
- you are entitled to a copy of this form after you have read and signed it
- you voluntarily agree to participate in the study entitled: *The Construction and Validation of an Instructor Learning Analytics Implementation Model to Support At-Risk Students*

Participant's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Participant's Name: \_\_\_\_\_ Date: \_\_\_\_\_

Signature of Person Obtaining Consent: \_\_\_\_\_

Date: \_\_\_\_\_

Initials: \_\_\_\_\_ Date: \_\_\_\_\_

Page 3 of 3

## Appendix I

### Email Sent to Delphi Panel

Dear Delphi Panel,

Thank you for agreeing to review the instructor learning analytics implementation model to support at-risk students and provide feedback as a means of validating the model internally. The following questionnaire is meant to assess whether the model adheres to the suggestions made during the focus group discussion. It is also meant to measure the usability of the model. I have attached the model to this email. Please review it, complete the following questionnaire, and return the questionnaire to me by email. Any and all feedback is appreciated.

1. Do you agree with the components represented in the model? Yes/No. Please Explain.
2. Do you agree with the guidelines provided? Yes/No. Please Explain.
3. Do you feel the model is complete? Yes/No. Please Explain.
4. What recommendations do you have for improvement of the model?
5. Do you feel that the model is useful (i.e. it enables the user to achieve their goal)? Yes/No. Please Explain.
6. Do you feel that the model is efficient (i.e. the user can quickly attain their goal by using this model)? Yes/No. Please Explain.
7. Do you feel that the model is effective (i.e. the model performs as the user expects)? Yes/No. Please Explain.
8. Do you feel that the model is learnable (i.e. the user will be able to become comfortable using the model in a timely manner)? Yes/No. Please Explain.

I will review and revise the model based on your feedback and return the revised model to you. Revisions will be made until consensus is reached and the model is approved. This will serve as internal validation of this model. Please try to complete the questionnaire within 1-2 weeks.

I have also attached to this email a participation letter/statement of informed consent for Delphi Panel participation. Your completion of the questionnaire indicates your consent to participate. Thank you so much for your time.

Holly McKee, MS, RHIA  
Instructor  
Department of Business and Computer Science  
Everett Dobson School of Business and Technology  
Southwestern Oklahoma State University

Stafford 307  
580-774-3049  
holly.mckee@swosu.edu



## Appendix J

### Delphi Panel Participation Letter



NOVA SOUTHEASTERN UNIVERSITY  
College of Engineering and Computing

Title of Study: *The Construction and Validation of an Instructor Learning Analytics Implementation Model to Support At-Risk Students*

Principal investigator  
Holly McKee, MS, RHIA  
100 Campus Dr.  
Weatherford, OK 73096  
580-774-3049

Co-investigator  
Dr. Marti Snyder, Ph. D.  
3301 College Avenue  
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(954) 262-2074

Institutional Review Board  
Nova Southeastern University  
Office of Grants and Contracts  
(954) 262-5369/Toll Free: 866-499-0790  
[IRB@nsu.nova.edu](mailto:IRB@nsu.nova.edu)

Site Information:  
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If you agree to participate, you will be asked to complete the questionnaire included in the email you received. This questionnaire will help the researcher validate the model to support instructor use of learning analytic tools to support academically at-risk students. The questionnaire will take approximately fifteen minutes to complete.

**Risks/Benefits to the Participant:** There is minimal risk to you for participating, and you may elect to discontinue participation at any time without any danger of retaliation from the researcher or the college. There are no direct benefits to you for taking part in this research study. However, the college may elect to use the final model as the basis for implementing instructor learning analytics tools. If you have any concerns about the risks/benefits of participating in this study, you can contact the investigators and/or the university's human research oversight board (the Institutional Review Board or IRB) at the numbers listed above.

**Costs and Payments to the Participant:** There is no cost for participation in this study. Participation is voluntary and no payment will be provided.

**Confidentiality:** After completion of the study, all data collected will be kept for a minimum of 36 months as required by NSU. Records will be kept by the researcher and the Institutional



Research Department in locked cabinets or encrypted and password protected electronic devices. All information obtained in this study is strictly confidential unless disclosure is required by the law. However, NSU IRB or the dissertation chair/thesis adviser to the researcher may review research records as needed. Your name will not be used in the reporting of information in publications or conference presentations.

**Participant's Right to Withdraw from the Study:** You have the right to refuse to participate in this study and the right to withdraw from the study at any time without penalty.

**I have read this letter and I fully understand the contents of this document and voluntarily consent to participate. All of my questions concerning this research have been answered. If I have any questions in the future about this study they will be answered by the investigator listed above or his/her staff.**

**I understand that the completion of this survey implies my consent to participate in this study.**

## Appendix K

### Quirkos Report

# Quirkos Report



This report was generated by McKee on Aug 10, 2016 9:59:05 AM for the following file: Learning Analytics.qrk

## Sources Summary

Title	Author	Date and Time	Length	Quotes #
Focus Group 1	McKee	Jun 15, 2016 8:47:28 PM	14269	38
Focus Group 2	McKee	Jun 15, 2016 8:48:06 PM	13476	49
Survey Text	McKee	Jun 15, 2016 8:50:29 PM	2649	4

## Quirks Summary

Quirk Title	Parent	Grandparent	Description	Author	Date	Total Codes
Caution			Expressing caution/hesitation in the use of LA	McKee	Jun 15, 2016 9:29:13 PM	0
Overdependence	Caution		The pitfall of relying too heavily on LA	McKee	Jun 15, 2016 9:50:19 PM	9
Skeptical of LA	Caution		caution against trusting to heavily in LA	McKee	Jun 15, 2016 9:36:32 PM	11
Working the System	Skeptical of LA	Caution	Students learn what these tools measure and spend time working the system rather than learning	McKee	Jun 15, 2016 9:55:22 PM	2
Rhetorical Literacy	Skeptical of LA	Caution	Use wisely	McKee	Jun 15, 2016 9:57:48 PM	4
Question of Usefulness	Caution		Are LA tools useful or appropriate?	McKee	Jun 15, 2016 9:45:41 PM	4
Adoption			embracing the use of LA in the classroom	McKee	Jun 15, 2016 9:14:12 PM	0
Early Identification/Intervention	Adoption		Using LA early in the course to identify at-risk students and intervene before it's too late	McKee	Jun 15, 2016 9:03:37 PM	7
Reaching out	Adoption		Using LA to reach out to students so they know you notice and care about their performance	McKee	Jun 15, 2016 9:06:01 PM	8
Frequency	Adoption		How often is LA being consulted	McKee	Jun 15, 2016 9:09:42 PM	5
LA as evidence	Adoption		using LA to legitimize your concern for a student or to check their story	McKee	Jun 15, 2016 9:09:04 PM	11
Self-Reflection	Adoption		Using LA to reflect on your course and teaching	McKee	Jun 15, 2016 9:08:48 PM	10
Intervention strategies			Developing consistent intervention strategies	McKee	Jun 20, 2016 10:01:38 PM	7
Align LA with pedagogical intent			Instructor must decide whether LA aligns with the way their course is structured and taught	McKee	Jun 15, 2016 9:39:07 PM	11
Relationship			LA can't tell if a student is personally at-risk	McKee	Jun 22, 2016 1:28:03 PM	2
<b>TOTAL NUMBER OF CODES</b>						<b>91</b>
<b>TOTAL NUMBER OF QUIRKS</b>						<b>15</b>

## Main Canvas Views

Quirks Canvas - Primary



## Text Sorted by Theme

### Early Identification/Intervention

” W feels that these tools are most effective early in the semester because it is important to identify which students aren't logging in during the first week of the course. This is why instructors should make an assignment due during this time.  
Source: *Focus Group 2*

” S ; You can identify the most at-risk within the first week. Then you can see within the first 3 weeks if they are going to commit.  
Source: *Focus Group 2*

” She feels that you must identify at-risk students early. If you try to help it is often too late.  
Source: *Focus Group 2*

” S - echoed the idea of identifying students early.  
Source: *Focus Group 2*

” T . It is important to identify "where is the point of no return in your courses?"  
Source: *Focus Group 2*

” If the analytics could track task initiation that would be great. If something is due Friday, I would prefer to hear that people are not starting it yet on the preceding Wednesday rather than the following Saturday.  
Source: *Survey Text*

” early detection of at risk students.  
Source: *Survey Text*



## Reaching out

” M : feels that one of the advantages of SWOSU is that it is a smaller university. Using these tools to contact students who are struggling shows them that someone notices and cares. It's important to identify and reach out to them just for the sake of them not feeling like no one notices or cares that they are struggling.

Source: Focus Group 1

” D : says it's just about reaching out, showing that you notice and you want to help.

Source: Focus Group 1

” She says shows the students that you are aware of what they are doing and how they are performing. Giving them a heads up early on makes them feel that they are in charge of their performance. Sometimes they may just admit that they are lazy, but at least it is up to them how they will move forward. It also lets them know that you can identify problems.

Source: Focus Group 1

” A : “They know they are “missed”

Source: Focus Group 1

” D. reaching out to them is the most important tool and discovering what they need

Source: Focus Group 1

” S. : : contact them, and sometimes they start to take control.

Source: Focus Group 1

” Consensus that LA can help show that you are paying attention, you care. It helps maintain student accountability if they know the instructor can see more detail about their activity.

Source: Focus Group 2

” J. : : Can use these tools to recognize students who are falling behind and make the student feel like are not going unnoticed

Source: Focus Group 2

## Frequency

” M : uses DD in her course 2x per week and 1x per week as an admin for the RN to BSN program

Source: Focus Group 1

” M : checks CA 1x per week

Source: Focus Group 1

” A : “generally 2-3 times per month”

Source: Focus Group 1

” M : once or twice a week

Source: Focus Group 1

” M : once a week, maybe more if expecting something.

Source: Focus Group 1

## LA as evidence

” Sometimes sends screenshots to at-risk students of the graphs/visualizations so they can see how they are performing in relation to a student who is performing well in the class.  
Source: *Focus Group 1*

” She often uses CA to confirm or dispute a student's story (ex. My computer froze up in the middle of an exam). She also feels that CA helps to stop cheating. This tool helps the instructor to see the details of what the student was doing in the system. How long they were in, what exam items they were clicking on, if they spent time writing or copied and pasted, etc. It gives the instructor insight into what they students are doing when logged in to Canvas.  
Source: *Focus Group 1*

” CA is useful in sending students visualizations/graphs of their performance  
Source: *Focus Group 1*

” M is going to use DD documentation of interactions in a grade appeal to show that the student was contacted by the instructor multiple times.  
Source: *Focus Group 1*

” checkout students' stories.'  
Source: *Focus Group 1*

” D - at the end of the semester to confirm or dispute students who feel they didn't get the grade they deserved.  
Source: *Focus Group 1*

” S feels that she uses CA after she notices that a student is having problems to confirm  
Source: *Focus Group 1*

” D, uses Canvas to back-up a student with issues like cheating and testing.  
Source: *Focus Group 1*

” Uses programs to basically catch student lying. Like looking at how they completed tests.  
Source: *Focus Group 1*

” J : uses LA to justify your concern, backup your intervention. Explain to a student that they need to improve, you have black and white number to backup what you are saying.  
Source: *Focus Group 2*

” It helps maintain student accountability if they know the instructor can see more detail about their activity.  
Source: *Focus Group 2*

## Self-Reflection

” Uses Canvas Analytics more for item analysis. To make sure test items are fair. Look for items that are commonly missed to identify why.  
Source: *Focus Group 1*

” can show instructors what level of interaction in discussions results in highest student evaluations (not too much or too little)  
Source: *Focus Group 1*

” S : uses CA to look at test items- is it her teaching? The question is just higher level? Is it a bad question?  
Source: *Focus Group 1*

” M also mentioned her student portfolios to measuring outcomes. They are color coded according to how they are progressing in the program and is a great way to visualize performance. These measures and LA tools often match up to their performance on the NCLEX. They receive NCLEX reports on their students' performance (how many questions, how long, pass rate, etc.). This is also helpful in identifying courses that may be a bottleneck and apply early intervention in those areas.  
Source: *Focus Group 1*

” uses to analyze online exams which is helpful.  
Source: *Focus Group 1*

” M. uses Canvas for item analysis, uses graphs to show students to compare their grades to a successful student.  
Source: *Focus Group 1*

” Can use it to see if there are holes in your teaching methods.  
Source: *Focus Group 1*

” J : uses CA for quizzes and tests for item analysis to identify bad questions, look at her own topic coverage to see where there might be room for improvement  
Source: *Focus Group 2*

” Discussion of using LA to analyze your teaching and adjust courses based on findings (when are students actively involved, when do they check out, where are areas of improvement?)  
Source: *Focus Group 2*

” J. : use primarily with quizzes and tests to determine if there were bad questions that most students missed.  
Source: *Focus Group 2*

## Intervention strategies

” We had a discussion of providing these types of pre-formatted messages to instructors and advisors. This would be helpful so that instructors can save time and direct the student where they need to go. These messages could be personalized but would save time and help the instructor. This would also provide a consistent message to students.

Source: *Focus Group 1*

” Preformatted messages and flowcharts of what to do/when/where to send students would be helpful. When is it appropriate to contact retention coordinator?

Source: *Focus Group 1*

” There was a discussion about how LA and perhaps the use of pre-formatted messages to students at-risk or asking for some sort of assistance would provide a consistent message across courses.

Source: *Focus Group 2*

” Perhaps pre-formatted messages to point students to campus resources. This is already located in “resources for student success”. Students are often unaware and still ask questions. We could point them to this or copy and paste the info into emails.

Source: *Focus Group 2*

” There was a discussion of providing guidance on when it is appropriate to send students to the retention coordinator and what interventions should be made first.

Source: *Focus Group 2*

” L : Having prefabricated information to tell students would help to stay consistent with what we say.

Source: *Focus Group 2*

” effectively integrate these tools and then how to apply the results to improve student success.

Source: *Survey Text*

## Align LA with pedagogical intent

” M : you need to know your instructors and your courses. For example, module 7 in their courses is often used as a time of working on the final project so there is not much activity. You need to know and understand the pause in this course- understand the flow.

Source: *Focus Group 1*

” Use of LA depends on the course format, pedagogical intent, and course structure.

Source: *Focus Group 1*

” M : says it also depends on the desire of the faculty member. Some don't want to use this technology and perhaps don't need to. Some faculty have very personal relationships, can remember all the names and faces, knows when students aren't there, and are struggling. Some don't use the LMS more than they have to.

Source: *Focus Group 1*

” D : "Begin with an end in mind."

Source: *Focus Group 1*

” M : It is important to familiar with the courses before looking at analytics to truly get the most out of it.

Source: *Focus Group 1*

” M : : faculty members have to have a desire to learn about their students, no matter how advanced these programs get.

Source: *Focus Group 1*

” She feels that it is important for instructors to understand what goes into the tool.

Source: *Focus Group 2*

” T : you should analyze what elements of the LA tools will add value to your course. Figure out what adds value beforehand to see how to use LA in your course.

Source: *Focus Group 2*

” It is important to ask if it is useful in the course.

Source: *Focus Group 2*

” T : It is important to identify "where is the point of no return in your courses?"

Source: *Focus Group 2*

” Not all information through the analytics are relevant for every assignment.

Source: *Focus Group 2*

## Overdependence

**”** M : - use LA like a ladder not a hammer. Micromanagement ends poorly. Help identify what instructors and students need. How you can help. Use as a tool not a weapon.  
Source: *Focus Group 1*

**”** “Use it as a ladder not a hammer”. Use it as a tool to help.  
Source: *Focus Group 1*

**”** She always cautions faculty to put too much stake in this because it's not always reflective of the situation.  
Source: *Focus Group 2*

**”** It's too easy for instructors to over utilize or put too much stock in LA because they produce “pretty shiny charts”  
Source: *Focus Group 2*

**”** D : use LA critically  
Source: *Focus Group 2*

**”** B : summary of the discussion: we should be careful with the use of LA. It's not the end-all be-all. It's a problem in our society in general for people to want a quick-fix answer. Something that will make it all better, but that's not how it works. There is a time and a place for LA. Let's not be too critical or to enthusiastic.  
Source: *Focus Group 2*

**”** W : LA is a tool not a weapon, but it's only one tool in your box  
Source: *Focus Group 2*

**”** T : worries about risk of admin using as the end-all one and only tool. She feels that this is a greater risk for admin than faculty because they are worried about the bottom line.  
Source: *Focus Group 2*

**”** B. : Don't let the analytics be our only resource for tracking students.  
Source: *Focus Group 2*

## Skeptical of LA

” In Dropout detective, sometimes their score is not always representative of the student.

Source: *Focus Group 1*

” LA not accurately tracking time spent looking at course materials.

Source: *Focus Group 2*

” Can this really identify at-risk students?

Source: *Focus Group 2*

” difficult to compare apples to apples with different LA tools

Source: *Focus Group 2*

” She questions what goes into the algorithms in LA that label students at-risk. She feels that it is important for instructors to understand what goes into the tool.

Source: *Focus Group 2*

” D : these tools are too often about the bottom line. They don't take into account the cultural context of the campus (ex. students working on a family ranch and struggling to keep up).

Source: *Focus Group 2*

” She fears that faculty and admin can't reach a "rhetorical literacy" with this type of data related to student retention. She thinks they can be useful at a faculty level, but worries about the use of LA at an administrative level.

Source: *Focus Group 2*

” W : worries that it will become like the movie "Minority Report"

Source: *Focus Group 2*

” J : nervous about the use of LA where success is measured in relation to the other students in the course (Civitas) because she wants the metric to be again her set standard for the course. Students could learn to work the system (like grading on a curve). This only happens if grades are assigned based on LA. Some instructors give participation/engagement grade based on LA.

Source: *Focus Group 2*

” greater risk for admin than faculty because they are worried about the bottom line.

Source: *Focus Group 2*

” Would feel more comfortable using analytics that say where they are getting information.

Source: *Focus Group 2*

## Question of Usefulness

” R questions how much time it would take to use these tools and how much the instructor should commit to helping at-risk students based on these tools.  
Source: *Focus Group 2*

” K LA won't help some students. They are simply bound to fail. They need to take the course again because they weren't ready. Your interventions won't help.  
Source: *Focus Group 2*

” I'm still not completely sure of the purpose on the at-risk side. If we choose to use the analytics to identify the student, how much are we, as instructors, committing ourselves to make sure the student passes? I know that would be a personal decision, but I feel like I would be pressured to use these instruments to a certain degree  
Source: *Focus Group 2*

” K. : sometimes there is nothing analytics can do to help a student pass a class. She I afraid that teacher may be punished for dropping a student that needed to be dropped.  
Source: *Focus Group 2*

## Relationship

” T how to identify at-risk students- a student's father had a heart attack last semester and dropped off from the course. She had to reach out to find out what the problem was. She reached out to the Foundation for help. Sometimes students are personally at-risk rather than academically at-risk. A discussion took place about students being personally at-risk in this way vs. academically at-risk. These tools don't help much to identify these problems, but can help show when students are struggling.  
Source: *Focus Group 2*

” D. . Analytics can't measure cultural issues that different areas like farmers who have to leave school to help their family. Analytics are useful at a faculty level, but maybe not at a higher level.  
Source: *Focus Group 2*

## Working the System

” Students could learn to work the system (like grading on a curve).  
Source: *Focus Group 2*

” Students might just learn to work the system like they do for everything else ("you want more clicks, I'll give you more clicks"). Students log in and go away just to log time spent. They might spend more time working the system than learning and improving.  
Source: *Focus Group 2*



## Rhetorical Literacy

” D : use LA critically

Source: *Focus Group 2*

” T : recognize your own bias with LA

Source: *Focus Group 2*

” She fears that faculty and admin can't reach a "rhetorical literacy

Source: *Focus Group 2*

” Discussion of the theories behind the development of the tool(s) would be helpful

Source: *Survey Text*

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