

Evaluation of a Predictive Model – Montana Early Warning System
Technical Report Draft: RQ 2 (Mixed Methods)
Using Longitudinal Data to Support State Policymaking Competition (NCER)
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Executive Summary

Research over the past two decades has focused on one aspect of dropout prevention: early identification and monitoring of at-risk youth. Behavioral interventions have been the primary focus of this literature; however, there is renewed emphasis placed on attendance and academic risk factors under ESSA (O’Cummings, M. & Therriault, S.B., 2015). Recognizing a need to promote early identification, stakeholders within the Montana Office of Public Instruction (OPI) framed a comprehensive system of supports in FY 2013, principally a diagnostic tool, which allows for the linkage of data to intervention and the ability to target resources where the intervention is most likely to be effective. Such supports became known as the Montana Early Warning System (EWS).

These supports target risk factors and the dropout probabilities associated most importantly with attendance, behavior, coursework, and mobility based on eleven Logistic Regression models (disaggregated by grade level). These models predict binary outcomes (for example, graduate or not) and have been refined over the past decade by training the data against the actual data from graduates and non-completers during the past year. In doing so, OPI has achieved a high degree of accuracy. By 2022, only 3.04% of students were identified as graduates, but instead go on to dropout (False Negative). In addition, 5.70% of students are identified as at-risk, but instead go on to graduate (False Positive). 91.26% of students were identified and proceed to graduate or dropout in line with this identification. This study, an evaluation of the Early Warning System, establishes an evidence base in Montana surrounding early identification and monitoring. It also fills a gap in the literature nationally where research literature on the effectiveness of Early

Warning Indicator Systems (EWIS) was identified to be sparse (Faria, A.-M., Sorensen, N., Heppen, J., Bowdon, J., Taylor, S., Eisner, R., & Foster, S., 2017; Marken, A., Scala, J, Husby-Slater, M. & Davis, G., 2020).

This evaluation is based on three separate tasks. The first of which is an analysis of the functional process of predicting dropout and graduation. Does the system predict as reliably dropout and graduation? We know the system predicts dropout well based on the process of refinement of the model. However, we do not know if the model reliably predicts graduation. This addresses ‘false alarms’ and false negatives involved in model building. It also addresses an important kind of False Positive, those students identified by the system, receive timely intervention, and proceed to graduate. The second task focuses on analyzing the degree of implementation of the program by creating a classification of low, medium, and high adopters. It further analyzes mediating and moderating factors to the implementation, the quality of the tool, the role of interventions, and the effectiveness of the tool. The third task is primarily quantitative and focuses on subgroups identified in the analysis. It is our hopes to triangulate findings between tasks in line with a mixed methods framework to allow analysis and conclusions based on both qualitative and quantitative findings. This technical report focuses on Task 2 (Mixed Methods). It is based on five research questions that address the degree of implementation:

- a. What is the level of adoption in participating schools?
- b. What are the mediating and moderating factors that impact implementation?
- c. Does the OPI EWS work as Intended?
- d. What are the perceptions of the quality of the EWS?
- e. How does the OPI data tie into evidence-based interventions?
- f. What are the perceptions of the success of the program at the school level?

This process involving adoption, factors which heighten adoption, the EWS business requirements and professional development, the tie of data to intervention, and the perceptions of the quality of the EWS implementation provide a lens on how one SEA may establish a data culture surrounding graduation in schools. It identified four transversal themes which are present in the data: the development of a data culture, longitudinal analysis, progress monitoring, and the process of building and sustaining relationships.

This evaluation study focuses on one period of the EWS (between 2015 and 2019) which represented the timeframe that supports were scaled up to a statewide rollout. In 2015, the EWS was brought to scale based on the success seen during a pilot phase in both model refinement and in data use among participating schools. We choose to analyze the next five years as this system was brought to scale.

During this period, roughly a third of the schools were Pilot schools (representing 18 districts) and the remainder were schools inspired by bringing the intervention to scale. It was also identified that much of the work of the Early Warning System was paused during the COVID pandemic. By focusing on the years prior to COVID, we are more likely to identify trends anticipated as schools emerge from the pandemic. This allows for conclusions based on whether efforts should be made about the future viability of the program in the post COVID era.

Three levels of adoption were found with the use of archival, interview, and survey data collected for this study. The hallmark of high adopters is that they have both formal and informal dissemination practices and have developed a data culture around dropout. This last point is important. Many schools interviewed did express engagement (tight coupling) and survey data indicates that EWS data was helpful in making decisions surrounding dropout. We do see

expressed engagement occurring with many schools who also have well established indicators such as a direct tie of the data to an intervention as well as a high degree of follow up and progress monitoring of students over time. The latter distinguishes between types of high adopters (the degree to which progress monitoring using the tool occurs). While there is variation in which the model is adopted within levels, we do see that many high adopters want longitudinal data, want additional data tools, and have made steps to make a data culture surrounding dropout prevention function and thrive.

There are many schools that have medium adoption processes. The hallmark of this level is the form of dissemination of data related to the diagnostic tool. Medium adopters have informal (many times only 1 person looks and acts upon the data) and no formal dissemination practices (data is used only as a reference). Different trends with these schools are apparent. The first is they do not have a well-formed MTSS process or a school team specific to dropout prevention. Less than 4 people have access to the data. Frequently only the district administrator or principal uses the data as a reference. Teachers in these schools do not have access to the data. Also, progress monitoring, a key indicator defined by this study, is ill formed, and lacking.

The low adopters are those schools that have attempted to meet the basic business requirements of the model (data sharing), however over time they opted out of the model and uploaded less than 3 times. 132 schools are in this category representing 59.46% of all schools that expressed interest. Based on the interview data, many of these schools did indeed view the value of a EWIS. This value was often well formed and targeted to how they would be able to use the data. Moreover, archival data indicates that there are many aspects of need that are shared with medium and high adopters. However, they did not find their solution with the EWS.

Not all schools place an emphasis on dropout prevention let alone develop a data culture surrounding the use of a diagnostic tool. Evidence suggests that this occurred with non-adopters. This finding is triangulated from those schools with no experience with the EWS who said prior to learning about a EWIS, their school did not emphasize dropout prevention. Moreover, non-adopters have different contextual, institutional, and outcome indicators than adopters. This difference suggests that they are less likely to have a defined need for the program.

As revealed in the interviews there are a variety of mediating and moderating factors that determined the types of implementations and the variation in implementation within each type of schools. The primary factor seen in the data was the presence of a MTSS team or a team of educators working toward dropout prevention. Vision and dissemination of the data are important mediating and moderating factors as it indicates the level of the development of the data culture. Moreover, time in the program and time spent developing this data culture is important. For example, Pilot schools are more likely to use the EWS data when constructing interventions ($p = 0.021$).

The core of these factors is how the district finds value in the data and what they decide to do with the data. OPI can help this process. This process of finding value in the EWS tool was related to OPI professional development and outreach. Finally, in schools that have a high degree of spread of this data culture there is a focus on building relationships with OPI, within the school community (leadership and staff), and a focus on the relationships built with students. At the heart of dropout prevention is the belief that relationships matter. Survey results indicate that schools in small districts (less than 1000 students) are more likely to engage in follow up ($p = 0.037$). This stresses the importance of building relationships and the degree to which this occurs in small schools (Jerald, 2006; Bruce, M., Horning Fox, J., & Balfanz, R., 2011; Faria, et

al., 2017). Follow up is crucial and is a sign of a well-developed data culture. There is need to identify supports as a student's risk profile changes over time. By encouraging this, OPI could encourage progress monitoring using the tool. This involves setting markers, or triggering events, which frame the course an intervention. They identify when to start an intervention, when to confirm or adapt an intervention, and when to discontinue an intervention.

Based on the data, we conclude that the EWS model did work as intended. In fact, the professional development of the model was responsive and did change over time to meet emerging needs. The design of the tool was found to be adequate, similar to online tools associated with the MAPS test administration. The tool was found to be accurate among users. Even when the tool missed a particular student it tended to be the case that subsequent uploads identified the student.

Interview respondents reported many beneficial aspects to the EWS program. Much of this is seen in context to the benefits of a EWIS in early identification and monitoring. One principal remarked that he doesn't know what he'd do without the tool. The alternatives take time away from engaging the students and building relationships. One counselor remarked that she knew her students better through the tool and there were more opportunities to build relationships. In fact, these relationships were seen as crucial to student success, even among the most challenged students receiving the most intense supports.

Users also cited the least beneficial aspects of the program, two of which are noteworthy. Multiple users identify issues with access of the EWS on GEMS. This was reportedly an inhibiting factor to using the tool. Also, there were many issues regarding the inclusion of student mobility in the model. Respondents report this caused issues with false alarms; students that were identified by the system but who would succeed using universal supports. Indeed, false

alarm were seen as the principal sources of inefficiency with the system and confirms findings in the national literature (Bruce et al., 2011).

The tie of data to intervention was strong in high adopting schools. 50% of the survey respondents reported that they use the EWS data 'often' or 'sometimes.' An additional 25% report intense engagement with the tool. Stakeholders identified the supports they provide. These supports are generally used among all schools. These involved relationship building with the student, setting up clear goals, and follow up to this process. In high adoption schools, a MTSS model or a student intervention team were developed. These processes followed targeted student supports such as universal (Tier 1), intensive small group support (Tier 2), and comprehensive supports (Tier 3) with a focus on mentoring programs and relationship building. Regardless of the type of EWIS the system used, these strategies were apparent and used. Respondents claimed that they continued to use these strategies when transferring to a vendor model and noted the process of addressing issues with the EWS or the vendor data were the same.

Finally, there is a focus on the effectiveness of the model. This addresses four factors: progress monitoring, accuracy, students that the EWS may have missed, and perceived successes of the EWS model in their schools. Follow up to this study can investigate progress monitoring as it pertains to each school. It not only addresses the differentiation among high adopters and between high and medium adopters; it also provides important insights into the formation of a data culture. Students that may have been missed by the EWS was identified as an important topic. What users focused on was the value of early identification tied to the perception that they could not receive services from a EWIS elsewhere. For example, there are many student information systems in Montana, some of which do not have a EWIS and stakeholders rely on the EWS model. Stakeholders focused on perceived successes of the system. Survey and

interview respondents alike note that at least 75% of their identified students go on to graduate. Nonetheless, respondents focused on the fact that their system was a work in progress and can only be judged from the standpoint of how to improve it next year. This is seen in the fact that the dropout profile of their students changes over time with new cohorts of students. Meeting ever changing demands, schools focused adaptation of the model each year.

There are many successes to note, such as the ability to democratize access to a system of early identification. Research literature has identified that through much of their infancy, EWS were the purview of large school districts. By offering the opportunity to access an evidence-based system that is designed for a range of district sizes, the EWS programs provided accessibility and coverage. Moreover, according to respondents, the system is highly accurate, OPI outreach and support is comprehensive, and costs of the model are minimal even when factoring in staff time. While making the interventions more efficient, there was a decline of supports necessary per student due to early identification. An additional benefit of the EWS data is the ability to predict behavior in a way that is not dependent on demographic variables, economic disadvantage, and student status (e.g., disability or ELL status). Indeed, it removes potential barriers to an intervention and biases by instead focusing on areas that are under the control of educators.

These costs served to make interventions more effective and staff time more efficient. Many respondents to the interview commented that the overall costs of their drop out program did not go down. They were able to offer additional services to more students given the decline in cost per student. In many cases, when identified early, dropout prevention avoids the cost of more expensive long-term options such as alternative schooling.

Scale is crucial to understanding the degree of implementation. The process of scaling up the program met many successes and challenges. There are important differences in institutional

variables and student outcomes between kinds of adopters and non-adopters. The model is fully adopted among many high adopters; however, the model is still in the process of implementation in most participating schools. One of the reasons why this is occurring is that local factors dominate the decision to access and make use of the data. Local conditions are important. The similarity between medium to high adopters and low adopters stresses the point that it is the larger school environment that set the course for interest in the EWS model. Combined with this are the differences between this group and non-adopters. Non-adopters may have not seen this need for this tool given that their environmental factors are different and school size is predominantly among schools with less than 150 students.

Scale varies, although it is important to note that scale should meet the identified need and capacity in the school for a EWIS to be successful (Bruce et al., 2011). Identified need varies by schools. Some schools do not have priorities that would warrant the use of the EWS. Others lack the capacity, as seen in some small schools. While the EWS model is seen as successful, there are many areas for improvement. Universal coverage remains the goal in schools, however in two cases use of the data stopped when the grant that targeted that grade level ended.

Reengagement in the core reasons for using the tool and promoting dropout prevention policies is needed. Scale, capacity, and priorities will remain the defining elements of the future spread of the program and efficiencies of its programs.

Selected Recommendations

Longitudinal data was seen as crucial to identifying interventions, modifying interventions once in place, and creating thresholds for students to discontinue supports. The primary recommendation among users was to create ways to manage longitudinal data with reporting based on each risk factor and the dropout probability. Respondents request professional

development on the need is to establish guidelines (FAQ) when an EWS inspired intervention is not successful and ways to reassess and reassign interventions.

Interview respondents also discuss how the outreach by OPI was of good quality. They commented on the need for more presentations and workshops about the EWS. Respondents discussed how they wanted to focus less on the use and requirements of the tool, and more on the process of identifying students at risk, establishing thresholds for support, and processes for progress monitoring of students.

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