SAS Data Notebook

Creating lifelong learners
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About SAS Curriculum Pathways

Available to educators at no cost, SAS® Curriculum Pathways® provides interactive, standards-based tools, resources, and apps in English language arts, mathematics, science, social studies, and Spanish for grades K-12 and beyond. SAS focuses on topics where doing, seeing, and listening provide information and encourage insights in ways conventional methods cannot. Built in accordance with how students learn, SAS provides engaging content that can be differentiated to meet varied needs. SAS provides learner-centered activities with measurable outcomes and targets higher-order thinking skills. Materials are linked to state and common core standards. Educators can use these resources in a variety of technology settings (www.sascurriculumpathways.com).
Introduction

Recently, there has been an increasing focus on boosting academic rigor by updating learning objectives and having teachers modernize their instructional methods. Students are now expected to both master academic content and demonstrate academic independence as well as self-regulate learning. Extensive research has shown that these behaviors are associated with greater academic motivation and success. One successful method for developing self-regulatory behaviors is encouraging students to set explicit, measurable goals, use quantitative and qualitative means to track progress, and utilize data-supported evidence to reflect on academic achievements and refine previous goals.

Data notebooks, an aggregated space for setting, tracking, and reflecting on academic goals, are widely popular for developing students’ academic, self-regulatory behaviors. Common instantiations of data notebooks are paper-pencil, three-ring binders that house documentation of students’ learning goals, mission statements, quantitative data, reflections, and the like. Such notebooks have been successfully implemented in the classroom and research-based evidence supports the use of resources targeting specific, individual facets of self-regulated learning.

Bringing the success of the paper-pencil notebooks into the 21st century, we developed SAS Data Notebook, an iPad app for creating, maintaining, and sharing data notebooks.

Motivation: Creating Lifelong Learners

Although not often directly specified in academic standards, learning how to learn is perhaps the most important product of a K-12 education. Therefore, a high-quality education challenges students to not only build and master academic content but also to become independent, high-level thinkers. Students should leave high school equipped with the cognitive and metacognitive abilities necessary for lifelong learning. In short, today’s students should embody the characteristics of a self-regulated learner.

Self-regulated learning is a term used to describe the behaviors of students who actively control their own learning by “[sustaining] cognitions, behaviors, and affects that are systematically directed toward the attainment of goals.” Self-regulated learners are equipped with a sufficient set of learning strategies and have the motivational control to put forth the necessary effort to engage in these cognitive processes. While students often show great variance in their self-regulatory behaviors, proficiency of such skills can be influenced and improved through direct instruction and modeling. Furthermore, there is evidence that students who are better able to regulate their learning in an intentional and reflective way often demonstrate greater academic motivation and achievement.

Although encouraging self-regulation is critical for student success, curricula often provide ambiguous techniques for increasing these behaviors. With respect to developing self-regulatory skills, research-based best-practices suggest teachers should turn to contextualized methods requiring students to explicitly engage in behaviors including setting specific, measurable goals, diligently monitoring progress toward such goals, engaging in strategies that encourage metacognitive awareness, and reflecting on previous actions.

The Baldrige Education Criteria for Performance Excellence suggest using a student data tracking system or data notebook for modeling and developing students’ self-regulatory behaviors. Data notebooks provide single aggregated spaces where students can set their own measurable goals, evaluate and reflect on their progress, and refine their goals accordingly. Empirical studies have shown significant differences in academic motivation between students who set and track their own goals and students who are...

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assigned them. Furthermore, qualitative studies show that the use of data notebooks in the classroom “is very empowering for students, giving them ownership of their education”.

Beyond self-regulatory behaviors, the use of data has recently become a necessary component for effective communication at all grade levels. For example, in the Common Core State Standards, anchor standard CCSS.ELA-Literacy.CCRA.SL.4 and anchor standard CCSS.ELA-Literacy.CCRA.SL.5 state students should “present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience” and “make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations” respectively. With respect to reflecting upon and detailing one’s academic progress, explicit goal setting and monitoring provides an excellent platform for utilizing data and evidence for communication.

SAS Data Notebook

SAS Data Notebook (Figure 1) is a free tool that brings the traditional three-ring binder to the iPad. Designed to support students’ self-regulation, SAS Data Notebook provides tools for students to set personal goals, monitor their own learning, reflect on previous work, and communicate their progress to teachers and parents using real data. Within the notebook, students can use built-in templates to create mission statements, set goals, generate checklists, reflect using plus/deltas, create and practice spelling lists, and plot histograms. SAS Data Notebook also includes a blank page and scratch paper template that enables students to load pictures, drawings, and more into their notebook. Students can also add sections to the notebook in order to set, monitor, and reflect on individual goals by subject.

Key Design Elements

The design and development process for SAS Data Notebook is iterative in order to continuously refine the product based on latest best-practices and research-based principles. Therefore, all decisions regarding the integration and design of embedded features are grounded within a sound theoretical framework and evidenced by empirical research. Features and their associated justifications are detailed in the following section. Given the ever-changing nature of self-regulated learning research and in order to maintain pedagogical correctness, SAS Data Notebook will continue to evolve as new research and industry standards arise. Therefore, areas for future work are also included in this report.

Instructional Guidance

Research tells us very clearly that self-regulatory behaviors are learned and developed overtime. Moreover, best-practices for instruction suggest instructors be explicit and model goal behaviors in context. In other words, students should be encouraged to engage in self-regulatory activities during their classroom activities instead of in a separate study skills class, for example. As a result, Data Notebook intentionally provides guidance and support to students as they organize and create notebook content.

Page Templates

Data Notebook’s library of page templates functions as a graphic organizer for students. Each template comes with support information to guide students through creating each page. For example, the goal-setting template asks the student a series of questions to ensure they set finite, measurable, attainable goals – the difference between reading at a particular level and measuring progress towards that level and generally working toward becoming a better reader. Support information outlines the rationale behind creating each page providing prompts for inputting useful, productive data.

We understand no matter how large our template library grows, it is impossible to support the needs of every student. To address this issue, Data Notebook includes a scratch paper page to serve as a catch-all space. Here, students and teachers can capture or upload pictures of custom, paper templates that can be marked-up with provided drawing tools.

Organizational Support

Proficiency in self-regulatory behaviors widely varies not only between students but also within an individual student. A student motivated to do well in science might not show the same motivation in English language arts. Similar examples of domain specificity can be made in the areas of strategy use and metacognition. Therefore, such behaviors should be modelled across disciplines. For this reason, Data Notebook allows students to organize their pages in user-defined sections (e.g., Math, Behavior, and Reading).

Sharing Notebooks

Sharing functionality in Data Notebook allows students to email their work to another user. Through the share feature, teachers can easily check in on students’ notebooks, and parents have access to a wealth of data about their child’s progress.

12 Common Core State Standards for English language arts and literacy in history/social studies, science, and technical subjects. Washington, DC: Authors.
Scaffolding

As previously discussed, modelling self-regulatory behaviors is often necessary, especially for less-proficient students. Encouraging self-regulation early provides a solid foundation for future development in this area. By utilizing the sharing function, teachers can create “skeleton” notebooks to share with their students. Such notebooks come pre-filled with sections and pages leaving the student to only worry about filling in personal details. In the beginning, modelling a high-quality notebook is a great first step and prevents students from feeling immediately overwhelmed with the task. As students begin to master these skills, they can set up their own notebooks without anxiety.

Student-Parent-Teacher Communication

Sharing notebooks supports student-teacher-parent communication and allows students to take an active role during parent-teacher conferences. Using a data notebook as a centerpiece, students can guide the conversation through their academic progress. The student is then challenged with demonstrating metacognitive skills through reflecting on their strengths and weaknesses, which are often the focus of such conferences.

Preliminary Evaluation

A preliminary investigation into the use of SAS Data Notebook sought to answer the following research questions: 1) How do teachers perceive the use of the SAS Data Notebook app affects students’ self-regulatory behaviors and academic achievement?, and 2) How are students using the SAS Data Notebook app as a data point when communicating educational progress?

A total of eight elementary and middle school teachers (ranging in experience, educational technology experience, and level of comfort with technology in the classroom) were asked to reflect on their experiences with SAS Data Notebook using a researcher-constructed survey. The survey asked participants to reflect on students’ self-regulatory behaviors including metacognition, strategy use, and motivation as well as students’ communication regarding educational progress. Prior to implementing the SAS Data Notebook app in their classrooms, all participants had experience using a non-digital form for data notebooks.

Results

Using a mixed-methods exploratory design, quantitative ratings of overall satisfaction, student self-regulatory behaviors, and communication with parents were triangulated with qualitative reports to further validate the data.
How do teachers perceive SAS Data Notebook affects students’ self-regulatory behaviors and academic achievement?

To understand teacher’s perceptions of self-regulatory behaviors, participants were asked to specifically reflect on the components of self-regulated learning: metacognition, strategy use, and motivation. On average, participants felt SAS Data Notebook did have a positive effect on their students’ metacognition (M = 3, SD = 1.18), strategy use (M = 3.63, SD = 1.44), and motivation (M = 3.63, SD = 1.40). In line with these findings, participants commented that their students “are eager to enter their data and see their scores on the graphs” and “like to track their data and see progress.” With regard to metacognition, one teacher reported that having “successful data to support it” was useful when “students are trying to meet their weekly and daily goals.” Finally, teachers felt that using Data Notebook was beneficial to overall academic performance (M = 3.75, SD = 1.38).

How are students using SAS Data Notebooks as a data point when communicating educational progress?

On average, participants felt the app was beneficial for aiding their communication with parents and students (M = 3.38, SD = 1.68). One noted that “Keeping track of how each child does is helpful when I meet with each student. During our conference time, we use their data from SAS to discuss weekly and daily goals.” Another stated, “During conferences, I shared the students’ SAS work with their parents. Also, I use their data to share with parents during the school year.” Participants felt the app helped students communicate with their parents about their academic performance (M = 3.89, SD = 1.33). One teacher pointed to the portability of the iPad as particularly useful for communication stating that “It’s nice to have the data for each student right there on their iPad. It can also be shared with parents daily when the child takes his/her iPad home each night.”

Implications & Discussion

While it is believed that self-regulatory behaviors are acquired over time through guidance and practice, research suggests students, even those of the same age, demonstrate a wide range of proficiency. Such findings highlight the need for more explicit, contextualized self-regulated learning instruction. Flexible tools, such as SAS Data Notebook, are great resources for encouraging students to take control of their learning across content areas. The findings from this study also support this notion. Overall, integrating the SAS Data Notebook app was perceived to have a positive effect on students’ self-regulatory behaviors and overall academic achievement. Furthermore, students’ Data Notebooks were posited as a useful tool for communicating educational progress. In fact, only one of eight participants indicated they do not plan to integrate SAS Data Notebook in her classroom instruction next year.

It should be noted, however, that implementing programs like SAS Data Notebook must be done with care. Students’ self-regulatory skills are developed overtime and building proficiency often requires direct instruction and modeling. Therefore, instruction around the use of these tools and cultivating motivation for setting goals, monitoring progress, and reflecting on results is critical. In fact, two of the eight participants in this study felt SAS Data Notebook did not improve their students’ self-regulatory skills. These teachers pointed to conceptual misunderstanding as a potential problem. One noted that she, “will spend more time in August emphasizing how to stay organized and updated. This will alleviate issues that I have encountered this year.” The other said he will, “have more upfront training for students to be more independent with their data notebook.”

Results should be interpreted with care as there are several, notable limitations. First, the sample used for this investigation was very small and does not represent the larger population of classrooms utilizing the SAS Data Notebook app. Secondly, the degree to which Data Notebook was integrated over the course of the 2013-2014 school year was not controlled nor was the manner in which students used the app; direct comparisons between the participants should be made with caution. Thirdly, it is important to consider students’ self-regulatory skills prior to using the Data Notebook app in order to better understand the direct effect of using the tool throughout the school year. This study did not include measures of past performance to control for preexisting differences between students. Lastly, the measures used for this study were researcher-constructed, perceptual, and self-report in nature leaving room for measurement error.

More rigorous investigations with more vigilant experimental control, sufficient power for more sophisticated statistical analyses, and validated measures for each of the study’s variables are necessary to ensure the validity of these preliminary findings. Additionally, as self-regulated learning behaviors develop overtime, it would be interesting to understand the differences in effectiveness of using Data Notebook between grade levels. Nonetheless, design considerations for SAS Data Notebook are grounded in research-proven principles and the findings from this small exploratory study show promise for supporting the development of students’ self-regulatory skills.
Future Work

Although SAS Data Notebook currently integrates several research-based design features, the scope of self-regulated learning is quite expansive leaving much room for additional components. The set of future features is derived from user requests as well as ongoing review of relevant research.

For More Information

For additional information including how to get started with SAS Data Notebook, classroom integration strategies, and the latest updates, see our blog series: http://blogs.sas.com/content/sascp/tag/8002


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