



## Improving Student Engagement by Integrating Adaptive and Collaborative Learning Technologies



Personalized Learning Begins Here

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## Executive Summary

Pedagogical research has proven the efficacy of adaptive learning and collaborative learning, demonstrating that adaptive learning optimizes learning success while collaborative learning sparks cognitive development. Additionally, both methods have been shown to increase student engagement, which researchers point to as a significant factor in increasing learning outcomes.

The potential for increasing engagement is of particular importance to teachers since research places the percentage of disengaged middle and high school students between 25 percent and over 66 percent (Taylor, Parsons 2011). This means between a quarter to two-thirds of students in middle and schools are neglecting studies, ignoring instruction and at risk of dropping out.

Technological advances have enabled educators to quickly and efficiently bring their instruction in line with these two approaches, but maximizing the benefits of these technologies requires integrating them into classroom practices as seamlessly as possible by removing the silos in which they operate.

The Snapwiz learning platform seamlessly combines context-aware social learning with adaptive learning technology to deliver a better engagement experience to students. The system includes a collaborative learning network that allows discussions to occur around educational content as well as an adaptive learning engine that delivers a personal learning experience based on individual needs, learning styles and preferences.

This paper discusses the benefits learners derive from such adaptive and collaborative pedagogical approaches and corresponding technologies as well as optimization challenges. The paper concludes by describing how the Snapwiz platform solves the issue of integration.

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## Introduction

Two instructional methods, adaptive learning and collaborative learning, are winning acclaim in K-12 classrooms. Research has demonstrated that both methodologies are beneficial to in-depth learning of instructional content.

### Benefits of Adaptive Learning

The adaptive learning approach tailors content delivery and instruction to each student's mode and pace of learning. Once a student's baseline proficiency and learning needs are determined through an initial diagnostic assessment, teachers employ the appropriate instruction, intervention, continuous evaluation, personalization and ongoing feedback that will enable that student to achieve established learning goals. In addition to providing personalized support, the process encourages students to become self-directed learners by continuously showing them how far they have progressed, the goals that need to be reached and how to accomplish them.

Research has long confirmed that the adaptive learning method is more effective than generalized approaches. An example is the findings of four studies conducted at 11 different school sites over a three-year period. According to the researchers, the students in adaptive learning environments consistently earned higher achievement scores on standardized math and reading tests than their control group peers did. In fact, the studies found that a higher than expected percentage of the adaptive learning students scored at or above the 75th percentile in the tests (Wang, Gennari, Waxman 1984).

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## Benefits of Collaborative Learning

Collaborative learning refers to an instructional method in which students collaborate with each other and the instructor. The collaboration may be impromptu or conducted in a specific group or team setting. Objectives can range from discussing a concept to working together on a project. In addition to being an effective tactic for retaining information, collaborative learning has been shown to produce higher-level thinking skills such as critical thinking, a set of information processing and analytical skills that make possible a deeper understanding of instructional materials and a greater “ownership” of one’s own learning process.

According to researchers, when student peers argue with one another, clarifying and evaluating each other’s ideas and points of view, the cognitive conflict spurs cognitive restructuring and development. Elaborating on what a discussion partner had said with elements from one’s own thinking has also been linked to post-test gains. Another interesting finding was that individuals often benefited from the collaborative process even if the reasoning used was constructed individually, without help from others in the group (Tudge 2000).

## A Combined Approach

**While adaptive learning and collaborative learning have been proven efficacious as separate instructional strategies, bringing the two together within a curriculum allows each to reinforce the effects of the other.**

The higher-order thinking skills generated by collaborative learning expedite the adaptive learning process by spurring comprehension and self-direction. Additionally, research has found that students with a higher knowledge base, which is acquired more efficiently via adaptive

learning, are much more likely to apply skills and behaviors that make the collaborative learning process fruitful. Two of the actions shown to produce collaborative learning success were referring to theoretical and earlier knowledge and being focused on goals (Tudge 2000), both of which would be fortified by adaptive learning.

The advent of the Common Core State Standards, which call for in-depth conceptual learning, higher-level thinking and collaboration, gives even more impetus for the inclusion of both methodologies in the classroom. From the early grades onward, students now need to demonstrate conceptual understanding and abstract reasoning, work together on projects, and provide peer feedback and critiques. As they work with these new rigorous demands, K-12 students would benefit from adaptive learning and collaborative learning environments' reinforcing effects as described above.

### Benefits of a combined approach

<b>Adaptive Learning</b>	<b>+</b>	<b>Collaborative Learning</b>	<b>→</b>	<b>Combined Outcomes</b>
Personal Learning Preferences	+	Social Learning Preferences	→	Superior Learning Path for Individuals
Optimized Learning Path for Learning Goals Achievement	+	Proficiency and Progress Monitoring	→	Improved Goals Compliance and Engagement
Semantic Tagging of Content	+	Social Tagging of Content	→	Effective Recommendation of Remediation Content

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## Barriers to Implementation

In today's classrooms, instructors often lack the time to manually carry out adaptive learning. Since each student's learning preferences and needs must be determined, large class sizes, the norm across many districts, significantly increase the amount of time required to complete all the steps that researchers have identified as essential for the effective application of the methodology:

- Creating and maintaining instructional materials
- Developing student self-responsibility
- Diagnostic testing
- Instructing
- Interactive teaching
- Monitoring and diagnosing progress and ongoing needs
- Motivating
- Prescribing activities or interventions
- Recordkeeping

(Wang, Gennari, Waxman 1984)

Among the obstacles to collaborative learning is the configuration of the average classroom, which is designed to accommodate teacher lectures rather than students' working together, and the class time period, which may curtail or interrupt discussions. In terms of interpersonal relations, individuals who dominate the discussions or refrain from speaking up for fear of embarrassment may intimidate shyer students. Also, the dynamic flow of face-to-face discussions discourages participation from introverted students who take more time to think through their comments before expressing them.

## Technological Solutions for Methodologies

Since educators face several obstacles to the effective implementation of either the adaptive or collaborative learning approaches, a curriculum combining both practices presents a significant challenge. However, in recent years, technology has done a great deal to foster the implementation of adaptive and collaborative learning methodologies individually.



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Adaptive learning technology streamlines the essential steps identified by educational researchers, automatically diagnosing and monitoring students' needs in order to provide personalized learning. Consequently, while an instructor may struggle to manually determine the learning preferences and needs of an entire class, adaptive learning algorithms will collect the required information as each student engages with the system at separate workstations. The algorithms will also prescribe action, provide feedback and aggregate or separate the data as needed.

Technology has also removed the physical barriers to collaborative learning since several online spaces, all of them designed to encourage discussion, are now available. In fact, it has been observed that many shy students become very active and engaged in online collaborative spaces, such as a discussion threads, because they face no time restrictions for composing answers or comments and they can participate without interruption (Harasim 1990).

Moreover, online interaction has become so prevalent that educators can opt to incorporate a multitude of social networking options in their instructional strategies. Professional teaching literature is now filled with advice about interacting with students on popular social media sites such as Facebook or Twitter. Instructors can also incorporate more education-focused social sites like Edmodo into their lesson plans.

In short, technological advances have made it possible for educators to quickly and easily implement adaptive learning and collaborative learning in the classroom and beyond. But what has been missing to date is a system that combines the benefits of both into one seamless, holistic solution, a personal learning network.

### **Advantages of a Unified Platform**

The lack of seamless integration between the technologies facilitating adaptive and collaborative learning is the final barrier to effectively implementing both within a class or school curriculum. K-12 educators have been accessing the technologies as stand-alone platforms or as separate components of a learning management system. In fact, several learning systems have components that facilitate one methodology or the other rather than both. For those systems that have both, the technologies exist in separate silos.

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However, when educators and students have to leave one platform for another to transition between adaptive and collaborative practices, voluntary usage decreases and distractions abound. When instructors use whatever social media site they desire, students have to keep track of which teacher is on which site and, in some cases, at what time. This situation may either discourage participation or cause intermittent confusion over the location of a particular teacher or activity. Even when the technologies are relatively closer, housed in the same learning management system, users are still required to fully exit one section of the system in order to use another, which may also result in reduced use and increased distraction.

The extra time and effort involved moving between the separate spaces can result in distracted users putting off collaboration because of a perceived lack of time or overlooking the chance to voluntarily discuss a relevant issue. For example, having online collaborative spaces located away from the educational content as well as the adaptive learning system and its performance feedback increases the possibility that students will forget small but vital details about what they need to ask for in order to improve their learning as they participate in the collaborative process.



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## A Personal Learning Network

Snapwiz is a cloud-based “end-to-end platform” that delivers social learning by combining all three areas of the learning process (creation, connection and adaptation). Selected as a solution for organizing and delivering course material and tools that optimize proficiency and study time, the platform is designed to provide users with highly personalized experiences via adaptive, collaborative and interactive learning features uniquely designed to increase student engagement, retention and success.

### **Benefits of Seamless Integration**

The platform’s combined adaptive learning engine and collaborative social space allow students to quickly and easily post or review a note or comment in the system’s social stream while reviewing course content. All content (print, illustrations, video and audio) within Snapwiz is socially enabled, and educators can insert additional resources from the Internet and elsewhere to further customize the learning experience. The system records the likes, dislikes, comments, questions, and answers that students post regarding the content to facilitate future discussions and to allow teachers to monitor individual or group understanding of the content and intervene as needed.

The system’s authoring tool enables teachers to employ the social media practice of tagging content. The adaptive learning engine uses the tagging to tailor each student’s learning sequence, assigning them the questions that match their current learning level and needs. Snapwiz monitors students’ answers and can recalibrate a question’s difficulty designation based on actual use that is, if the majority of students find the question easier or more difficult than the teacher’s original estimation.

### **How Snapwiz Works**

As the only postsecondary learning platform that combines interactive authoring tools and context-aware social learning via adaptive technology, Snapwiz helps students learn by learning about them. While students progress through the course material, the system monitors each student’s mastery of, or attempts to master, the set learning objectives. It then provides remediation by adapting not just the

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learning sequence but the content itself so that students are not confused or discouraged.

Each student account includes a personal proficiency dashboard that provides an overview of the student's competence in the material currently being covered. As students work within the platform, the dashboard provides a comprehensive record, including performance on practice tests and the areas, which need the most work, enabling them to take ownership of their learning.

### ***Initial Analysis of Student Needs***

As students begin a new course or unit, they take a diagnostic assessment that produces a Performance Summary chart of their baseline proficiency in the topics that will be covered. The summary indicates the percentage of questions answered correctly, incorrectly and partially correctly. The summary also shows the learning objectives for the instructional material and how the questions answered mapped to those objectives. Students can select specific questions for review or simply mark them for future review.

### ***Adaptive Study and Practice***

The system continually offers the option of studying the instruction material or taking a practice quiz. When students choose the study option, a Browse by Study Objectives feature takes them to the e-text, multimedia tools or resources related to a particular study objective. When they opt for a practice quiz, the adaptive engine presents quiz questions appropriate to their current level of ability. The adaptive engine is so sensitive to learning differences and preferences that in a class of 100 students, no two students are likely to get exactly the same set of questions in exactly the same order due to their answers. As students complete these self-paced practice sessions, the system learns more about them and later notifies them with recommendations for adjusting learning.

The practice quizzes also include metacognitive icons that students can select in order to indicate their confidence in their ability to answer a particular question. A student who indicates a lack of confidence and answers correctly will see a set of similar questions while a student who is both confident and correct will progress to the next level or set of questions.

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During the practice sessions, students can add notes to specific questions. Since notes and questions created by students are automatically socially enabled, classmates will see the note as they come across the same question and can serve as the beginning of a discussion thread.

Students can practice at the chapter level, concept level, and also at specific learning objective levels. As they continue to practice, the system will show them how they did on every question and will adjust the difficulty level of questions based on their performance. After practice, users can go back to their home page to see their new dashboard summary and assess their overall progress.

### ***Measurement and Feedback***

Dashboard graphs and reports for student and teacher accounts make the system's feedback easy to understand, so both students and instructors have a clear understanding of performance. Teachers can see data from the class level through to individual student levels.

The charts include performance, productivity and metacognitive (the student's perception of their proficiency compared to their actual knowledge) data. Students can take action right from the reports through Study and Practice links available on every chart. Additionally, an activity timeline shows when they performed specific activities such as reading a particular chapter, posting a note, starting or participating in a discussion or completing a practice session so that they can easily determine if they have been neglecting a particular activity.

### ***Social Collaboration Features***

Snapwiz socially enables each student account by default in order to encourage students to connect with classmates and instructors. The main collaborative space, All Streams, resembles popular social media timelines, complete with a sidebar menu for easy access to a calendar, activity summary (notes shared, media contributed, discussions initiated or participated in), friends, assignments, messages, groups and courses (e-texts as well as learning tools such as text magnifier, highlighter, zoom pictures). Users can click any link to quickly access other parts of the system and then return to the social stream.

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## **Wiley Publishing Partnership**

In 2012, Wiley Publishing, a highly regarded company with more than 200 years in the educational publishing business, adopted advanced technologies developed by Snapwiz in order to apply the personal learning network to its well-known basal materials in more than 50 college-level courses. Through this personal learning network, college students now have the ability to combine adaptive and collaborative learning in order to optimize their own learning process in the ways and at the rate that best suits them. “The Snapwiz platform helps students navigate through their studies with a state-of-the-art user interface, highlighting both strengths and the areas where they need to invest more time,” said Joe Heider, Senior Vice President, Global Education at John Wiley & Sons, Inc.

Based on the research and evidence presented in this paper, Snapwiz believes its platform has great applicability in K-12 schools. By supporting their content with the Snapwiz personal learning network, K-12 publishers will maximize the impact, and thus the value, of their content.

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## Conclusion

The increased demands of the Common Core, universities, and the twenty-first century work place for strong content knowledge, self-direction, and higher-level thinking skills has made adaptive learning and collaborative learning vital parts of the modern curriculum. Technology has made the pedagogical methods easier to implement within the classroom, but has created silos of learning for each approach. In order to optimize the benefits of both approaches, the technology needs to be seamlessly integrated. Snapwiz offers an effective solution for optimizing the technology and student learning.

## About Snapwiz

Snapwiz offers a cloud-based platform that delivers a state-of-the-art personalized learning experience to students via adaptive, collaborative, and interactive technologies. Snapwiz works in close partnership with publishers to deliver engaging and personalized eBooks and courses. The company is headquartered in the San Francisco Bay area with offices in Bangalore, India, and is backed by Primera Capital.

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