



IJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 **Issue:** V **Month of publication:** May 2026

DOI: <https://doi.org/10.22214/ijraset.2026.81237>

www.ijraset.com

Call:  08813907089

E-mail ID: ijraset@gmail.com

Enhancing Students' Career Growth through an Interactive Aptitude Learning Platform

Shahanaz Begum, Boobathi, Duraimurugan, Govardan, Guhan
M.I.E.T Engineering College, India

Abstract: *E-learning platforms typically assume that the participants are in position of advanced self-regulated learning (SRL) capabilities. However, research indicates that students are found with insufficient autonomy and SRL competencies frequently abandon digital education programs before completion [3],[4]. Numerous digital learning environments have incorporated frameworks whose working based on Zimmerman's SRL model [12], [42] to focus on strengthening e-learning skills. This investigation specifically targets the enhancement of aptitude competencies of an individuals who seeks positions in MNC's. This study identified significant gaps in existing e-learning solutions [16], [17], particularly in the direction of providing organized practice steps, interactive engagement opportunities, and synchronous collaborative features. This website is developed as a solution in filling the above gaps including the following features in strengthening problem solving efficiency through competitive real-time challenges, providing community-based discussion forums, and team-oriented assessment activities resulting in higher performance rankings [29],[30]. The technology stack introduced in this work employes React.js with Zustand for creating frontend interface and state coordination, Express.js and Node.js for backend service management, MongoDB and Supabase for data persistence, and WebSocket technology for instantaneous communication capabilities. The system was evaluated with 60 final-year Computer Science students from an Engineering college, and it was evident that utilizing this e-learning platform their SRL capability was improved. [40], [55].*

Keywords: "Online education" - As Wang [6] notes, "digital learning environments require structured support mechanisms to maintain engagement and progression."

"Aptitude learning" - John and Smith [57] define this as "systematic skill development targeting domain-specific problem-solving capabilities essential for professional assessments."

"Self-regulated learning (SRL)" - Zimmerman [42] describes this as "self-generated thoughts, feelings, and actions that are planned and cyclically adapted to attain personal educational goals."

I. INTRODUCTION

Many online learning platforms have been developed by researchers, who expect learners to complete online courses independently and autonomously. As noted by Lin et al. [1], "self-regulated learning is crucial for success in online environments where direct supervision is minimal." These platforms provide learning materials in various forms, such as videos, animations, online text books, handouts, and slides, and discuss the contents of each learning unit. Students' understanding of each learning unit can be evaluated to measure the learning outcomes. However, according to Lin and Tsai [2], "some students do not possess high autonomy or a self-regulated learning ability" and "such students are expected to quit in-between the learning schedule, negatively affecting their learning outcomes."

Alraimi et al. [3] observed that "completion rates for Massive Open Online Courses (MOOCs) were significantly lower compared to traditional lecture-based learning." Jordan [4] further quantified this issue, reporting that "on average, fewer than 10% of students enrolled in MOOCs actually complete the course."

Aptitude tests are key components of academic assessments, competitive exams, and job placements. However, many students struggle with self-paced learning because of the lack of structured resources and interactive engagement. As Kumar and Gupta [59] point out, "traditional online learning platforms primarily offer static question banks or video-based courses, which often fail to address real-time doubts or foster peer collaboration." This study introduces Aptec, a web-based aptitude learning platform that enhances learning through the following:

- Organizing a structured collection of aptitude questions with detailed solutions
- Planning for weekly contests simulating real exam conditions
- Creating a real-time comment system for interactive discussions (while the learner is in the learning activity);
- The introduction of a group test feature enables multiple students to collaborate in a particular session.

A. Promoting SRL Ability

SRL ability is positively correlated with online learning outcomes [1], [2], [55], [56]. According to Lin et al. [56], "students possessing a high SRL ability on their own can select suitable learning tasks and follow a step-by-step procedure to reach their goals, shoulder the responsibility for their own learning, monitor their own learning process, and have self-motivation to learn."

Narciss et al. [5] assert that "it is expected from learners to have high SRL ability," and as Wang [6] notes, "the majority of learners encounter difficulties in maintaining positive SRL behavior throughout the learning phase." Various SRL models have been developed as documented by Panadero [52]. The top-rated and most widely used SRL models are those developed by Zimmerman [12] defined SRL as "self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals."

Pintrich [10] emphasized that "SRL is an active, constructive process whereby learners set goals and then attempt to monitor, regulate, and control their cognition"

Winne and Hadwin [53], who proposed an SRL model based on "four phases: task definition phase, goal-setting phase, phase for enacting study tactics, and one phase for adapting study."

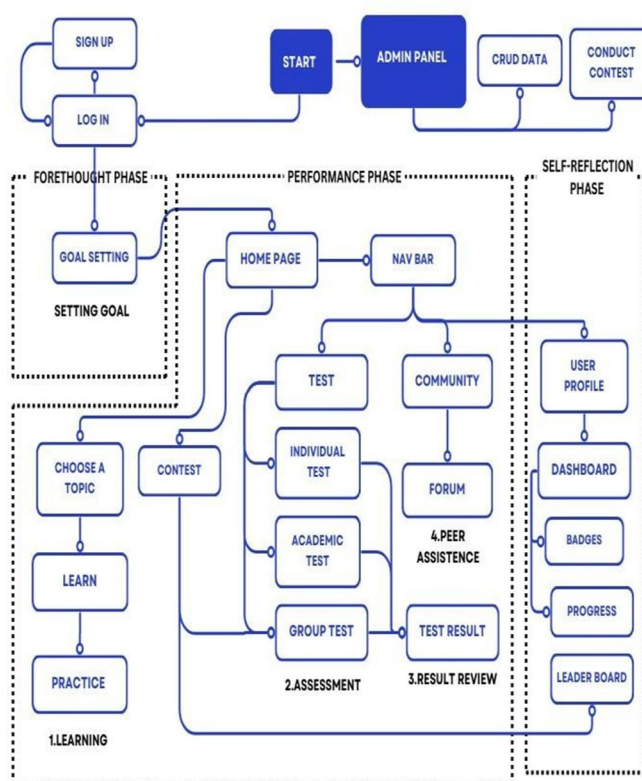


Fig. 1 Architecture Diagram

Studies have shown that Self-Regulated Learning (SRL) can be taught, trained, and enhanced (Lin et al. [1], Lin and Tsai [2], Wang [6], and Dabbagh and Kitsantas [14]); Zimmerman's model [12] stands out as particularly practical and well-structured for promoting these skills. As Zimmerman describes in his work [12], "self-regulated learning involves a cyclical process through three phases: forethought, performance, and self-reflection." This three-phase model was adopted as the foundation for Aptec platform design (Figure 1).

Aptec is an innovative approach to aptitude learning that incorporates features specifically designed to address the limitations of traditional e-learning platforms. As John and Smith [57] point out, "Effective aptitude development requires more than static content—it demands interactive engagement and structured practice." Our platform addresses these needs through four key components: a comprehensive repository of aptitude questions with detailed solution pathways, competitive weekly challenges that simulate examination conditions, an interactive commenting system supporting real-time discussions, and collaborative testing environments that enable peer learning.

The implementation of Zimmerman's model in Aptec begins with the forethought phase, in which students establish personalized learning objectives related to developing aptitude, logical reasoning, and technical competencies. Bandura [47] says that "setting goals gives you direction and gives you reasons to keep going until you reach your goals." During the performance phase, learners work with structured materials on different aptitude topics. This makes them more likely to take part in practice sessions. Lastly, the self-reflection phase included finishing the assessments and carefully judging the results of the learning. As noted by Schraw [51], "This cyclical process, when repeated consistently, gradually transforms external regulation into internalized self-regulation."

Previous studies have provided valuable insights into this field. Hwang et al. [15] developed a computer-assisted SRL system that enhances students' self-regulation by providing scores based on confidence, regularity, and spontaneity. These metrics help learners to monitor their progress and adjust their strategies accordingly. In a similar vein, Shih et al. [16] created an SRL system enabling learners to "set personal goals, customize learning paths, and review previous performance records." However, as Lin et al. [55] and Lin et al. [56] observed, these systems still largely depend on students independently navigating SRL phases—setting goals, completing tasks, self-reviewing, and self-reflecting—without sufficient structured guidance or collaborative support.

B. Group Awareness tools in a Computer-Supported Collaborative learning environment

The concept of Group Awareness (GA) tool has emerged from efforts to visualize collaborative activities within learning environments. Researchers like Bodemer and Dehler noted that these tools were "designed to make information about collaborative members' activities visible to all participants" (Bodemer & Dehler [25]). Early implementations focused on displaying interactions, such as question posting, response patterns, and message exchanges among peers in Computer-Supported Collaborative Learning (CSCL) environments.

These visualization tools present what Kimmerle and Cress [26] describe as "objective details of group participation," allowing students to see how their engagement compares with others. This transparency helps learners gauge their involvement relative to the group norms. Shih and colleagues

[16] found that such comparative information "significantly influenced students' motivation to participate more actively in collaborative tasks."

The basic idea behind GA tools is to create what DiMicco et al. [27] called a "shared understanding of the collaborative context." This mutual awareness opens up lines of communication, makes exchanges more meaningful, and helps ideas move more quickly between participants. These practical benefits have led to widespread use of many CSCL platforms. Janssen et al. [30] and Sangin et al. [31] are two examples of how these platforms have improved peer interactions. Beyond facilitating collaboration, these tools serve dual learning purposes. As Lin and Tsai [2] discovered in their 2016 study, "collaborative activities not only motivate task completion but provide critical moments for strategy reflection." Their research showed that both motivational boosts and reflective opportunities support the development of self-regulated learning behaviors. This connection between collaboration and self-regulation has been documented by several researchers (Wang [6]; Kitsantas [19]; Paris & Paris [20]).

Based on these findings, Lin et al. [1] integrated Zimmerman's three-phase SRL model into a team-based CSCL platform. Their system specifically highlights collaborative activities within teams to enhance teamwork quality and individual self-regulation abilities. A student in their study remarked, "seeing others' activities made me more aware of my own learning approach."

C. Role-Model GA

A foundational framework for understanding the development of self-regulatory competence is Zimmerman's multilevel model of self-regulated learning [37]–[39], [52]. This model delineates four progressive stages in which learners typically cultivate these skills.

- Observation: Initially, learners acquire skills indirectly by "observing a proficient model engaging in the desired learning behavior or task."
- Emulation: Following observation, learners attempt to "imitate the style and strategies demonstrated by the model while performing the skill themselves."
- Self-control: With practice, learners begin to "demonstrate the skill independently, without direct reliance on the model, exercising internal control over their performance."
- Self-regulation: In the final stage, learners achieve adaptive mastery, enabling them to "flexibly apply and modify the skill across varying environmental conditions and contexts."

The utility of peer role models in this developmental process is underscored by research such as Muir's [45], which suggests that "exposure to proficient peers demonstrating effective strategies for problem-solving significantly enhances learners' self-efficacy and subsequent performance, such as mathematical accuracy on post-tests." This exposure is crucial because it "allows learners to witness, hear, or read about successful strategies in practical application" [45]. Building on this, Bandura [47] posited that "when individuals observe others perceived as similar to themselves successfully performing tasks, their own belief in their capacity to master comparable challenges is strengthened." Witnessing a model of comparable ability to achieve success cultivates an expectation of personal success in observers, which, in turn, can substantially boost their task motivation [17], [18], [48], [51], [52].

Learners often find inspirational peer role models, particularly compelling, because these individuals offer "tangible, real-life examples of success that are perceived as more relatable and achievable" [27], [28], [45]. Because these models have already attained the goals towards which the learners are striving, they represent "motivational targets that possess both credibility and attainability" [27], [28], [45].

Consequently, this study introduces an extension of the traditional Group Awareness (GA) concept, termed role-model Group Awareness (RM-GA). The system developed in this study, Aptec, distinctively integrates both Zimmerman's three-phase SRL training model (forethought, performance, and self-reflection) and the novel RM-GA. This integration is designed to "allow learners to observe and gain insights from the learning context and processes of a designated group of role models during each phase of their SRL training." Ultimately, the system aims to systematically guide learners through the four developmental levels of Zimmerman's multilevel model (Observation, Emulation, Self-control, and Self-regulation), thereby fostering enhancement of their self-regulatory competence [40].

D. Research Aims

Many conventional e-learning platforms require learners to complete learning tasks independently without the collaborative elements found in Computer-Supported Collaborative Learning (CSCL) environments. As Wang [6] notes, "successful engagement with these platforms requires significant self-regulatory capabilities," since learners must autonomously navigate through materials such as online readings or instructional videos. Narcis et al. [5] and Kauffman

[8] confirmed that high Self-Regulated Learning (SRL) ability is essential for maintaining learning effectiveness in these environments. Although numerous e-learning platforms incorporate elements of Zimmerman's SRL model in their design, they typically lack mechanisms to support collaborative or group-based learning.

This study proposes a methodology that addresses this limitation by integrating Zimmerman's SRL training model with Role-Model Group Awareness (RM-GA) tools [53], [54], [55]. As Winne and Hadwin [53] emphasize, "providing strategic exemplars enhances metacognitive awareness and regulatory behavior adoption." The RM-GA information embedded in our platform reveals the learning context and activities of successful peer models during each SRL training phase, demonstrating how these individuals effectively complete various tasks. According to the social cognitive theory, learners who observe comparable peers who successfully complete tasks are likely to experience enhanced confidence and motivation. As Bandura [47] explains, "perceived similarity to models increases the persuasiveness of demonstrated successes," potentially leading learners to emulate these productive behaviors.

These motivational characteristics encourage sustained engagement with learning activities, fostering the development of SRL abilities within conventional e-learning environments [2], [10]. Research by Muir [45] and Murphy and Arao [46] indicates that "exposure to peer role models can significantly benefit learners with initially lower motivation and confidence levels." Lin et al. [56] further demonstrated that such modeling can accelerate the development of self-regulatory competence.

Our proposed methodology differs from that of Lin et al. [1] in two respects. First, while their method applies SRL training and GA tools within a collaborative CSCL environment, our approach is specifically designed for conventional e-learning platforms, where learners typically work independently. Second, as Lin et al. [1] explained, their GA information primarily "focused on collaborative activities among team members" in a CSCL context, whereas our RM-GA information emphasized the learning behaviors and strategies employed by successful role models during each phase of SRL training. We conducted an experimental evaluation of this system, with the results indicating increased student engagement throughout the learning process and corresponding improvements in achievement outcomes. The primary contribution of this research is the development of an effective e-learning platform that, as Wang [41] suggests, "supports the gradual development of self-regulatory behaviors while enhancing persistence in online learning environments." This approach shows promise for improving learning efficiency while addressing the common challenge of learner attrition in conventional e-learning contexts [40], [42].

II. PROPOSED METHOD

Figure 1 illustrates the architecture of the proposed method, where the Role-Model Group Awareness (RM-GA) mechanism is integrated within Zimmerman's SRL training model. As Zimmerman [43] explains, "effective self-regulation requires a cyclical process involving anticipation, performance, and reflection." In our system, role models are defined as learners who successfully assess a particular learning unit. The leaderboard functions as a visualization of role model performance by displaying learners who have excelled in the assessments.

An additional function of the system is peer assistance facilitated by the community forum. This forum enables students to seek help with challenges encountered during the learning process. According to Lin and Tsai [2], "collaborative problem-solving environments significantly enhance learning motivation and persistence." English and Duncan-Howell [17] further note that "digital forums create opportunities for just-in-time support that maintains momentum in self-directed learning activities." Thus, peer assistance through the community module plays a crucial role in fostering collaboration and supporting learners throughout their journey.

The following sections describe the function of each phase in Zimmerman's SRL training model and the corresponding RM-GA roles within the proposed system [43], [44].

A. Fore Thought Phase

1) Setting the Goal

In this initial phase, learners begin their learning journey by signing up or logging into a platform. They can then set specific learning goals using the "Goal Setting" feature. As Bandura

[43] emphasizes, "goal setting provides direction to one's efforts and creates incentives to persist until the goal is reached." Once the goal is set, the system guides them to the next step: selecting a topic.

The system directs the users to

- Choose a Topic: Learners select from a variety of aptitude sections (e.g., Speed, Time & Distance).
- Enter the Learning Module: Here read detailed explanations and view solved examples to build their foundational knowledge.
- Proceed to Practice: After engaging with the learning content, users solve relevant practice problems to reinforce their understanding before moving on to tests or contests.

This structured method helps students set clear goals and gives them the tools they need to interact with the material in a meaningful way. Schraw [51] says that "strategic planning and goal setting are basic metacognitive processes that make self-regulation possible."

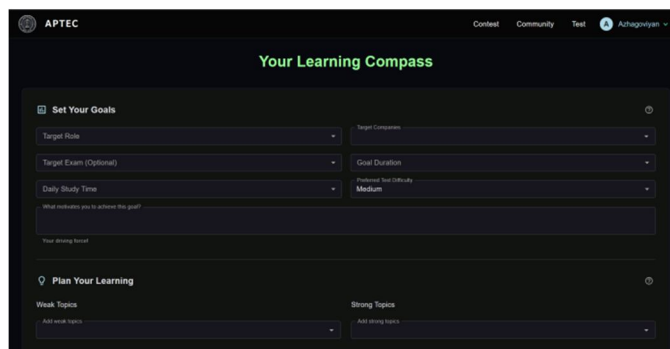


Fig.2 Goal Setting Module

Figure 2 shows the goal-setting phase, which is an important step in getting ready for the proposed system. During this phase, learners are systematically directed to "plan and set clear intentions," a process recognised in existing literature as crucial for "fostering motivation before engaging with the learning material" [21]–[23], [33]. Consequently, the primary objective of this structured methodology is to "assist learners in elucidating their objectives, thereby ensuring they are mentally equipped and concentrated on their educational goals" before engaging with subsequent instructional modules.

B. Performance phase

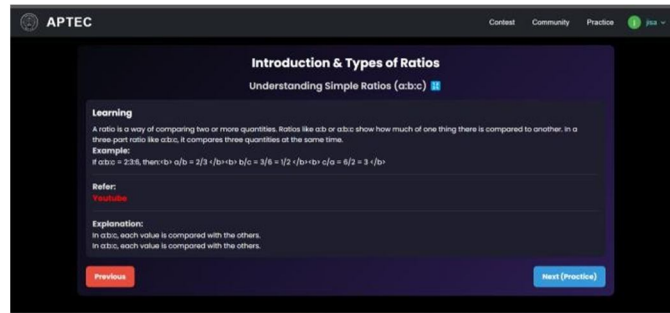


Fig.3a LearningModule

Fig. 3a illustrates the learning workflow integral to the aptitude preparation website, characterized by a design where "each topic is designed to integrate both explanations and problem-solving exercises." Within this structured approach, learners commence by "studying a detailed explanation of the concept." This foundational learning is subsequently reinforced through "a series of example problems," which are strategically included to "help them understand the practical application of the material," a pedagogical principle well-supported by research on effective learning strategies [37], [38], [49].

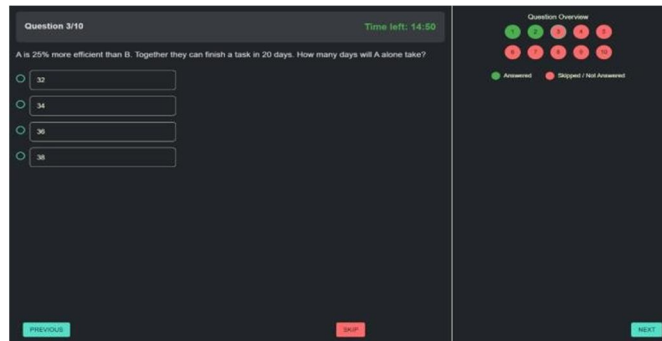


Fig.3b TestModule

Fig.3b gives a picture of the next step in the learning process, which is "after finishing the learning section, users must solve a set of practice problems." These problems have a specific purpose: they "are specifically designed to test their understanding of the topic." Moreover, progression is restricted: "The learner may only advance to the next topic after successfully answering the requisite number of questions." The goal of this design is to "make sure that learners fully understand each concept before moving on," which is a basic rule for structured learning [47],[48],[58].

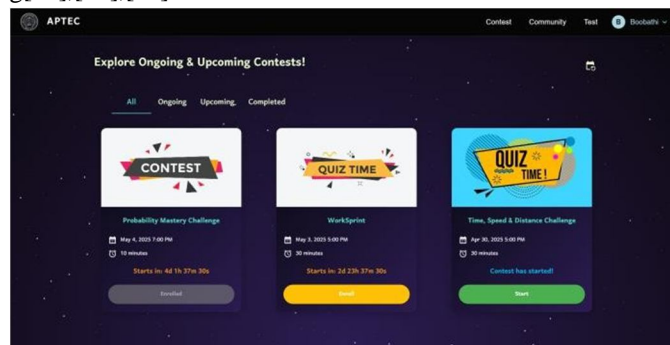


Fig.3c ContestModule

Figure 3c shows the system module that lets users "participate in different contests, which lets them test their skills against those of others." Users can join different contests based on their level or topic of interest. After they finish a contest, they get instant feedback on how well they did, including detailed results and rankings. "Test results are stored in the user's profile, allowing for performance comparison over time".

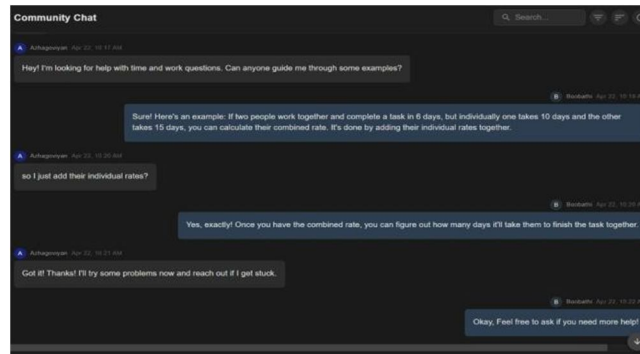


Fig.3dCommunityModule

Fig. 3d showcases the platform's dedicated community feature, designed to encourage users to connect, collaborate, and grow together as they share insights, learning strategies, and problem-solving approaches. By fostering open discussions and peer-to-peer support [1], [29], this interactive space cultivates a collaborative learning environment [17],[34]. This transformation of potentially isolated study into a shared journey is intended to enhance understanding and significantly promote motivation, continuous improvement, and a stronger sense of connection among learners [14], [39].

C. Self-Reflection Phase

1) Self-Reflection Phase–Progress Tracking & Motivation

After completing tests and practice sessions, users enter the reflection stage, where they can review their performance, identify areas of improvement, and stay motivated [30], [31], [32].

Rank	Name	Score
1	Boobathi M.L.E.T. ENGINEERING COLLEGE	30
2	DURAIMURUGAN G M.L.E.T. ENGINEERING COLLEGE	29
3	Abdul Rasheed M.L.E.T. ENGINEERING COLLEGE	26
4	Anumugam M.L.E.T. ENGINEERING COLLEGE	25
5	Guhan ADARSH SRIKANTHA SARETTI'S COLLEGE OF COMMERCE, SOCIAL	24
6	GOVARDAN N A M.L.E.T. ENGINEERING COLLEGE	22
7	Harish J M.L.E.T. ENGINEERING COLLEGE	20
8	Azhagoviyar M.L.E.T. ENGINEERING COLLEGE	19
9	Dinesh M.L.E.T. ENGINEERING COLLEGE	18

Fig.4aLeaderboard

Top scores show up live in Figure 4a, ranked by results plus how steady users are. The setup plays more like a game because of it, nudging people to push a bit harder without pressure. For many users, this acts as a strong motivator to stay consistent, push harder, and improve their rankings [39], [57], [59].

2) User Profile & Dashboard



Fig.4bDashboard

Fig.4b Each learner has a personal dashboard that tracks their progress across topics, shows completed practice sets, teststaken,scores,andimprovementovertime.This helpsusers reflectontheirlearningpatternsandadapttheirstudystrategies.

This structured self-reflection process, supported by the aforementioned tools, is further enhanced by the Role-Model Group Awareness (RM-GA) information integrated into the platform. The system is designed to allow learners "to assess their performance and compare it with that of the role-model group," as revealed by the RM-GA data. Beyond potentially "boostinglearners'effectiveness,confidence,andmotivation," the RM-GA information serves a critical function by highlighting "the difference between learners' achievements when working independently and when guided by the role model group." By "providing insights into their learning strategies," the RM-GA information is thus engineered to actively "encourage self-reflection, which can positively influence their future learning behavior" [14], [34]–[36], [50].

III. EXPERIMENT

A. Participant Profile

Experimental evaluation involved final-year Computer ScienceandEngineering(CSE)studentsfromanengineering institution in TamilNadu. Asnoted by Adalier [54],"subject homogeneity in educational technology studies enhances internalvaliditywhenmeasuringinterventioneffects."Given their common academic background and similar placement preparation status, the participantswere presumed to possess comparable baseline aptitude knowledge levels.

Before starting the lessons, learners got basic info about how the platform works and when it could be used. Right after, they began working through topics one at a time, much like what Johnson and Smith once detailed in their earlier work. Each student had to reach strong results on quizzes prior to moving forward - a method tied by Kumar and Gupta to deeper understanding and real-world application of skills. Access stayed open during training, so users interacted freely without limits. That openness shaped routines resembling genuine study habits.

B. Study Workflow

Starting off differently, the trial class builds key abilities by diving into practical subjects. Instead of theory alone, real-world tasks shape how students learn what matters most. Thesetopics,eachinvolvingpracticalproblemsolving,wereas follows:

- 1) NumberSystem
- 2) Percentages
- 3) TimeandWork
- 4) ProfitandLoss

A particular set of tools shaped how this system came together. Built piece by piece, it relied on chosen methods behind the scenes.

- React.js with Zustand for frontend development and state management,
- Node.jscoupledwithExpress.jsforbackendAPIhandling,
- MongoDBandSupabaseforuserdatastorageandquestion database management, and
- (4) WebSocketstofacilitatereal-timecommunication.

When learners try jumping ahead, the system steps in. Before moving on, they must show they understand what came before. Skipping isn't allowed until mastery is clear. Progress depends on proof of grasp, not speed. Only after showing skill does the next part open up.

After finishing the earlier part, participants moved back to the last SRL stage they had skipped. Once the testing time ended, everyone took a follow-up test. The goal of that check was to measure how well students learned when using the new method versus those taught through standard ways. Researchers also held talks meant to collect personal insights about each person's journey, especially looking at how individuals handled questions from examiners in real or practice job interviews

C. Evaluation Criteria and Tools

Most questions on Aptec came straight from real placement exams, carefully picked over time. Because of this, learners faced problems much like the ones seen in actual tests. One topic led to another, each built from genuine exam patterns. Exposure grew naturally, shaped by repeated practice with true-to-life challenges.

Every time someone used the platform, their actions got recorded automatically. These records formed a set of detailed traces showing how people moved through the interface. Each person's activity included specific measurements tracked over sessions.

Patterns began to appear once all entries were reviewed together.

- Number of logins: The total frequency of user logins in the system.
- Duration of Learning Sessions: The aggregate time spent by the user actively engaged in each learning session.
- Number of Topics Completed: The total number of learning topics successfully concluded by the user.
- Assessment Scores: The Performance scores recorded for each test or quiz attempt by the user.

This mix of data later helped check how steadily every learner kept up with their study times, giving a hint about their skill in managing their own learning. Though gathered in different ways, the pieces together showed patterns in who stayed on track without needing reminders or outside pushes.

IV. CONCLUSION AND FUTURE WORK

Learners find their footing here by setting targets, diving into tasks, then looking back on how far they've come - this flow comes straight from Zimmerman's view of self-driven growth. Phases loop naturally : planning kicks off, action follows, reflection wraps it up, forming a rhythm that adapts as users do. Old-school online courses lose people fast ; this one holds attention differently.

Built-in stages guide each step forward, others join in through shared activity, game-like elements nudge continued effort.

Progress sticks because the design keeps minds engaged across time.

Comparison Table: Base Reference System vs Our System

Component	Base Reference System	Our System	Advancements
SRL Framework	Zimmerman's 3-phase SRL model [1], [12]	Integrates Zimmerman+ RM-GA model at each learning phase	Role-model support boosts SRL skill development
Collaboration	Peer awareness in CSCL [25], [26]	Real-time discussion+ group tests	Promotes solo and peer-based learning synergy
Goal Setting	Minimal or basic [16], [24]	Structured goal module: topic-wise path + progression control	Enhances focus, autonomy, and planning
Interactive Learning	Static materials or delayed feedback [59]	Explanations, examples, timed practice modules	Encourages deeper conceptual learning
Assessment Flow	Isolated quizzes [16], [59]	Gated progression after mastering prior topics	Ensures complete understanding before moving forward
Gamification	Rarely used or superficial [41], [58]	Leaderboards, badges, weekly contests	Boosts learner motivation through engagement
Feedback System	Limited or delayed [5], [16]	Instant results + performance dashboard	Supports continuous reflection and improvement
Group Awareness (GA)	Team interaction only in CSCL [1], [25], [30]	RM-GA: View role model actions per SRL phase	Enables aspirational benchmarking even in non-collaborative setups
Technology Stack	Generic LMS setups	Full MERN: React, Zustand, Node, Express, MongoDB, Supabase, WebSockets	Real-time, scalable, and modern architecture
Application Scope	General SRL in blended learning [1], [15]	Targeted aptitude training for placements	High industry relevance, skill-focused design

One part of the system stands out - the community forum, a space where people ask questions, swap ideas, among work together. Research by Cho et al. [34] shows social links inside learning settings shape how info spreads plus affect ways problems get solved.

To keep activity going, alerts reminded members to join current talks. Such spaces build something English and Duncan-Howell [23] call digital groups offering emotional backing while cutting loneliness during independent study.

Not far off from watching someone good at a task,

peer involvement shows learners what effort looks like when it hits the mark. According to Lin and team [55], seeing how you stack up against others pushes subtle shifts in approach almost without thinking. Bright badges, points that add up, small rewards woven in to the design kept people moving forward.

Surprisingly, Wang [41] points out that using gamelike tools in learning pushes students to join more often while staying involved longer. Those who do well get small rewards, like digital badges, showing their growth clearly on screens they can check anytime. The leaderboard serves as a motivational tool by showcasing top performers. From Patel [57], competitive parts in learning tools make success more visible, which fuels drive by showing clear signs of progress. When users see how they measure up, it nudges them to think harder about their own growth. Recognition tied to these markers strengthens habits linked to strong performers. Over time, repeated exposure shapes behavior in subtle but meaningful ways.

One hour after logging in, users began showing clearer signs of self-directed learning. Studies by Barnard and team point out how organized practice with control methods sharpens thinking about thinking - especially online. Help from others in the group popped up faster here compared to standard digital classrooms. Quick chats and shared tasks opened windows into goal tracking most students usually miss. Support didn't fade over days - it stuck around, built momentum.

Starting with React.js up front, the system uses Zustand to keep track of changes. Instead of traditional methods, it pairs Node.js with Express.js behind the scenes. Data sticks around thanks to both MongoDB and Supabase doing their part. Communication happens instantly because WebSockets link everything together. Responsiveness stays strong on every device in play.

One step ahead, the system will grow into areas like spoken skills and hands-on subjects. Enhanced gamification should be implemented to increase engagement and promote consistency. As Kumar and Gupta [59] emphasize, "effective web-based learning platforms must balance structured content with interactive elements that maintain momentum across extended learning periods. Improving these features helps learners take more control of their progress while building skills that match real job needs. A clearer path unfolds when practice connects directly to goals people actually have.

REFERENCES

- [1] J. W. Lin, Y. C. Lai, and L. C. Chang, "Fostering self-regulated learning in a blended environment using group awareness and peer assistance as external scaffolds," *J. Comput. Assist. Learn.*, vol. 32, no. 1, pp. 77–93, Nov. 2016.
- [2] J. W. Lin and C. W. Tsai, "The impact of an online project-based learning environment with group awareness support on students with different self-regulation levels: An extended-period experiment," *Comput. Educ.*, vol. 99, pp. 28–38, Aug. 2016.
- [3] K.M. Alraimi, H. Zo, and A.P. Ciganek, "Understanding the MOOCs continuance: The role of openness and reputation," *Comput. Educ.*, vol. 80, pp. 28–38, Jan. 2015.
- [4] K. Jordan, "Initial trends in enrolment and completion of massive open online courses," *Int. Rev. Res. Open Distrib. Learn.*, vol. 15, no. 1, pp. 133–160, Jan. 2014.
- [5] S. Narciss, A. Proske, and H. Koerndle, "Promoting self-regulated learning in web-based learning environments," *Comput. Hum. Behav.*, vol. 23, no. 3, pp. 1126–1144, May 2007.
- [6] T.H. Wang, "Developing Web-based assessment strategies for facilitating junior high school students to perform self-regulated learning in an e-Learning environment," *Comput. Educ.*, vol. 57, no. 2, pp. 1801–1812, Sep. 2011.
- [7] R. Azevedo, J. Cromley, and D. Seibert, "Does adaptive scaffolding facilitate students' ability to regulate their learning with hypermedia?," *Contemp. Educ. Psychol.*, vol. 29, no. 3, pp. 344–370, Jul. 2004.
- [8] D. F. Kauffman, "Self-regulated learning in web-based environments: Instructional tools designed to facilitate cognitive strategy use, meta-cognitive processing, and motivational beliefs," *J. Educ. Comput. Res.*, vol. 30, no. 1, pp. 139–161, Jan. 2004.
- [9] A. Hadwin and P. Winne, "CoNoteS2: A software tool for promoting self-regulation," *Educ. Res. Eval.*, vol. 7, no. 2, pp. 313–334, Aug. 2010.
- [10] P. R. Pintrich, "The role of goal orientation in self-regulated learning," in *Handbook of Self-Regulation*. San Diego, CA, USA: Academic Press, 2000, pp. 451–502.
- [11] F. L. Winters, J. A. Greene, and C. M. Costich, "Self-regulation of learning within computer-based learning environments: A critical analysis," *Educ. Psychol. Rev.*, vol. 20, no. 4, pp. 429–444, Dec. 2008.
- [12] B. J. Zimmerman, "Attaining self-regulated learning: A social-cognitive perspective," in *Handbook of Self-Regulation*. San Diego, CA, USA: Academic Press, 2000, pp. 13–39.
- [13] M. Al-Smadi and C. Guetl, "Supporting self-regulated learners with formative assessments using automatically created QTI questions," in *Proc. IEEE Glob. Eng. Educ. Conf. (EDUCON)*, 2011, pp. 288–294.
- [14] N. Dabbagh and A. Kitsantas, "Personal learning environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning," *Internet High. Educ.*, vol. 15, no. 1, pp. 3–8, Jan. 2012.
- [15] G. J. Hwang et al., "The development of a computer-assisted self-regulation system on the internet," *Chin. J. Sci. Educ.*, vol. 15, no. 3, pp. 317–334, Jun. 2007.
- [16] K. P. Shih et al., "The development and implementation of scaffolding-based self-regulated learning system for e-learning,"

"Educ.Technol.Soc.,vol.13,no.1,pp.80–93,Jan. 2010.

- [17] C. McLoughlin and J. W. Lee, "Personalised and self-regulated learning in the Web 2.0 era: International exemplars of innovative pedagogy using social software," *Australas. J. Educ. Technol.*, vol. 26, no. 1, pp. 28–43, Jan. 2010.
- [18] F. I. Winters and R. Azevedo, "High-school students' regulation of learning during computer-based science inquiry," *J. Educ. Comput. Res.*, vol. 33, no. 2, pp. 189–217, Sep. 2005.
- [19] A. Kitsantas, "Fostering college students' self-regulated learning with learning technologies," *Hell. J. Psychol.*, vol. 10, no. 3, pp. 235–252, Jan. 2013.
- [20] S. G. Paris and A. H. Paris, "Classroom applications of research on self-regulated learning," *Educ. Psychol.*, vol. 36, no. 2, pp. 89–101, Jun. 2010.
- [21] H. Salovaara, "An exploration of students' strategy use in inquiry-based computer-supported collaborative learning," *J. Comput. Assist. Learn.*, vol. 21, no. 1, pp. 39–52, Feb. 2005.
- [22] M. McCaslin and D. T. Hickey, "Self-regulated learning and academic achievement: A Vygotskian view," in *Self-Regulated Learning and Academic Achievement: Theoretical Perspectives*. Mahwah, NJ, USA: Erlbaum, 2001, pp. 227–252.
- [23] R. English and J. Duncan-Howell, "Facebook® goes to college: Using social networking tools to support students undertaking teaching practicum," *J. Online Learn. Teach.*, vol. 4, no. 4, pp. 596–601, Dec. 2008.
- [24] C. C. Chang et al., "Constructing and evaluating online goal-setting mechanisms in a web-based portfolio assessment system for facilitating self-regulated learning," *Comput. Educ.*, vol. 69, pp. 237–249, Nov. 2013.
- [25] D. Bodemer and J. Dehler, "Group awareness in CSCL environments," *Comput. Hum. Behav.*, vol. 27, no. 3, pp. 1043–1045, May 2011.
- [26] J. Kimmere and U. Cress, "Group awareness and self-presentation in computer-supported information exchange," *Int. J. Comput.-Support. Collab. Learn.*, vol. 3, no. 1, pp. 85–97, Mar. 2008.
- [27] J. DiMicco et al., "The impact of increased awareness while face-to-face," *Hum.-Comput. Interact.*, vol. 22, no. 1, pp. 47–96, Dec. 2017.
- [28] J. S. Rozendaal, A. Minnaert, and M. Boekaerts, "The influence of teacher perceived administration of self-regulated learning on students' motivation and information processing," *Learn. Instr.*, vol. 15, no. 2, pp. 141–160, Apr. 2005.
- [29] J. Dehler et al., "Guiding knowledge communication in CSCL via group knowledge awareness," *Comput. Hum. Behav.*, vol. 27, no. 3, pp. 1068–1078, May 2011.
- [30] J. Janssen et al., "Visualization of participation: Does it contribute to successful computer-supported collaborative learning?," *Comput. Educ.*, vol. 49, no. 4, pp. 1037–1065, Dec. 2007.
- [31] M. Sangin et al., "Facilitating peer knowledge modeling: Effects of a knowledge awareness tool on collaborative learning outcomes and processes," *Comput. Hum. Behav.*, vol. 27, no. 3, pp. 1059–1067, May 2011.
- [32] A. Kitsantas and N. Dabbagh, *Learning to Learn With Integrative Learning Technologies (ILT): A Practical Guide for Academic Success*. Greenwich, CT, USA: Information Age Publishing, 2010.
- [33] B. Hu, A. Kuhlenkamp, and R. Reinema, "Supporting group awareness in web-based learning environments," in *Proc. Int. Conf. Eng. Employment Cooperative Inf. Syst.*, Sep. 2002, pp. 525–536.
- [34] H. Choetal., "Social networks, communication styles, and learning performance in a CSCL community," *Comput. Educ.*, vol. 49, no. 2, pp. 309–329, Sep. 2007.
- [35] M. M. El-Bishouty et al., "Social knowledge awareness map for computer supported ubiquitous learning environment," *Educ. Technol. Soc.*, vol. 13, no. 4, pp. 27–37, Oct. 2010.
- [36] K. Kreijns et al., "Measuring perceived sociability of computer-supported collaborative learning environments," *Comput. Educ.*, vol. 49, no. 2, pp. 176–192, Sep. 2007.
- [37] M. M. El-Bishouty, H. Ogata, and Y. Yano, "PERKAM: Personalized knowledge awareness map for computer supported ubiquitous learning," *Educ. Technol. Soc.*, vol. 10, no. 3, pp. 122–134, Jul. 2007.
- [38] C. M. Chen, C. M. Hong, and C. C. Chang, "Mining interactive social network for recommending appropriate learning partners in a web-based cooperative learning environment," in *Proc. IEEE Conf. Cybern. Intell. Syst.*, 2008, pp. 642–647.
- [39] P. Shea and T. Bidjerano, "Learning presence as a moderator in the community of inquiry model," *Comput. Educ.*, vol. 59, no. 2, pp. 316–326, Sep. 2012.
- [40] L. Barnard et al., "Measuring self-regulation in online and blended learning environments," *Internet High. Educ.*, vol. 12, no. 1, pp. 1–6, Jan. 2009.
- [41] A. I. Wang, "The wearout effect of a game-based student response system," *Comput. Educ.*, vol. 82, pp. 217–227, Mar. 2015.
- [42] B. J. Zimmerman, "A social cognitive view of self-regulated academic learning," *J. Educ. Psychol.*, vol. 81, no. 3, pp. 329–339, Sep. 1989.
- [43] A. Bandura, *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NJ, USA: Prentice-Hall, 1986.
- [44] D. H. Schunk, "Modeling and attributional effects on children's achievement: A self-efficacy analysis," *J. Educ. Psychol.*, vol. 73, no. 1, pp. 93–105, Jan. 1981.
- [45] C. Muir, *Motivational Aspects of Using Near Peers as Role Models*. Cambridge, MA, USA: Cambridge University Press, 2018.
- [46] T. Murphy and H. Arao, "Reported belief changes through near-peer role modelling," *Electron. J. English Second. Lang.*, vol. 5, no. 3, pp. 1–15, Dec. 2001.
- [47] A. Bandura, *Self-Efficacy: The Exercise of Control*. New York, NY, USA: W. H. Freeman, 1997.
- [48] I. J. Brown and D. K. Inouye, "Learned helplessness through modeling: The role of perceived similarity in competence," *J. Pers. Soc. Psychol.*, vol. 36, no. 8, pp. 900–908, Aug. 1978.
- [49] L. S. Vygotsky, *Mind in Society: The Development of Higher Psychological Processes*. Cambridge, MA, USA: Harvard University Press, 1978.
- [50] L. Earl and S. Katz, "Rethinking classroom assessment with purpose in mind: Assessment for learning, assessment as learning, assessment of learning," 2006. [Online]. Available: <https://digitalcollection.gov.mb.ca/awweb/pdfopener?smd=1&did=12503&md=1>
- [51] S. Kumar and P. Gupta, "Web-based learning platforms and their effectiveness," *Int. J. Digit. Educ.*, vol. 37, no. 2, pp. 88–104, 2019.
- [52] G. Schraw, "Promoting general metacognitive awareness," *Instr. Sci.*, vol. 26, no. 1/2, pp. 113–125, Mar. 1998.
- [53] E. Panadero, "A review of self-regulated learning: Six models and four directions for research," *Front. Psychol.*, vol. 8, pp. 422–450, Apr. 2017.
- [54] P. H. Winne and A. F. Hadwin, "Studying as self-regulated engagement in learning," in *Metacognition in Educational Theory and Practice*. Hillsdale, NJ, USA: Erlbaum, 1998, pp. 277–304.
- [55] A. Adalier, "Turkish and English language teacher candidates' perceived computer self-efficacy and attitudes toward computer," *Turk. Online J. Educ. Technol.*, vol. 11, no. 1, pp. 192–201, Jan. 2012.
- [56] J. W. Lin, "Effects of an online team project-based learning environment with group awareness and peer evaluation on socially shared regulation of learning and self-regulated learning," *Behav. Inf. Technol.*, vol. 37, no. 5, pp. 445–461, May 2018.



- [57] J.-W.Lin,H.-C.K.Lin,andH.-R.Chen,"Developingan E-learning platform capable of being aware of self-regulated learning behaviors of role models,"IEEE Trans. Learn. Technol., vol. 15, no. 6, Dec. 2022.
- [58] D. John and R. Smith, "Impact of peer learning on aptitudedevelopment,"J.Educ.Technol.,vol.45,no.3,pp. 56–72, 2021.
- [59] A. Patel, "Gamification in online learning: A case study,"Comput.Educ.,vol.102,no.4,pp.120–135,2020.



10.22214/IJRASET



45.98



IMPACT FACTOR:
7.129



IMPACT FACTOR:
7.429



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089  (24*7 Support on Whatsapp)