Shri Sant Gajanan Maharaj College of Engineering Shegaon [1]

Computer Science & Engineering Department [2]

Course Title & Course Code: Theory of Computation 4KS05

Class: Second Year B.E. CSE

Semester: IV

Name of the Course Teacher: C. M. Mankar

Title of the innovative practice: Interactive Problem-Solving Sessions with Visual Aids

Objectives / Goals of the Practice [3]

- To promote deep understanding of core Theory of Computation concepts. [4]
- To enhance student engagement and comprehension through hands-on problem-solving. [5]
- To improve clarity through structured visual delivery of automata and grammars. [6]
- To support exam readiness and academic performance. [7]

Use of Appropriate Methods: [8]

To achieve the stated goals, the following methods were implemented: [9]

- Interactive problem-solving sessions were conducted for each topic in the Theory of Computation syllabus, focusing on designing automata (DFA, NFA, PDA, Turing Machines) and grammars (CFG, CSG).
- Sessions were enriched with visual aids, including state diagrams, transition tables, parse trees, and step-by-step derivations to illustrate the working of automata and grammars.
- Complex concepts such as Pumping Lemma, undecidability, and Chomsky Hierarchy were explained using step-by-step visual presentations and practical analogies.
- Demo sessions were conducted using tools like JFLAP or similar simulators to showcase real-time execution and behavior of automata for given inputs.
- Interactive teaching methods were integrated into the sessions, including mini-quizzes, class discussions, and live problem-solving on the whiteboard or digital screen.
- Q&A sessions were held at the end of each topic to reinforce student understanding and engagement. [10]

Significance of Results: [11]

- The interactive problem-solving approach led to a notable improvement in students' conceptual clarity across key Theory of Computation topics such as Finite Automata, Context-Free Grammars, and Turing Machines. [12]
- Students demonstrated enhanced classroom engagement, as evident from increased participation during Q&A and discussion sessions. [13]

- Academic performance improved, with a measurable rise in average scores in internal assessments and university examinations in the Theory of Computation subject. [14]
- The visual and demo-based delivery helped bridge the gap between theoretical understanding and practical application, especially in complex topics like pushdown automata and undecidability. [15]
- The availability of shared problem solutions, visual examples, and simulator files enabled self-paced learning and revision, supporting diverse learning styles and preparation strategies. [16]

Effective Presentation: [17]

- The sessions were carefully structured to cover each Theory of Computation topic clearly and logically, beginning with fundamental concepts and progressing to advanced areas. [18]
- Use of high-quality visuals such as state diagrams, transition functions, parse trees, and derivation steps helped simplify complex information. [19]
- Real-time demonstrations were incorporated using tools like JFLAP to show practical applications alongside theory. [20]
- Sessions were interactive, with frequent pauses for questions, mini-quizzes, and group discussions to maintain student engagement and check understanding. [21]
- Each session included clear learning objectives at the start and summary points at the end to reinforce key takeaways. [22]
- The use of consistent formatting, color coding, and clear diagrams enhanced readability and focus during the sessions. [23]
- Faculty shared solved problems, relevant simulation links, and practice sets, enabling students to review material at their own pace. [24]

Pos Mapped: PO1, PO2, PO3, PO4, PO9, PO10, PO12

Reflective Critique [25]

- Faculty observed student engagement levels, participation rates, and problem-solving approaches during the interactive problem-solving activities. [26]
- Faculty noted that the use of visual aids and live demos made complex Theory of Computation topics more accessible, especially for students with varying learning styles. [27]
- A few students felt that the practice problems greatly supported their revision, but they suggested that more independent design assignments could further reinforce learning. [28]

Critique Review Form Link: [Placeholder for actual link, if any, similar to cite: 39 in the original document, which is `https://forms.gle/LPtH1Gc7wRJ1DLPF7`]

Evidences of success [29]

- **Enhanced Student Engagement:** Attendance and participation during Theory of Computation lectures and problem-solving sessions improved, with more students actively asking questions and contributing to solutions. [30]
- **Positive Feedback:** Students found the interactive problem-solving sessions clear, engaging, and highly helpful for understanding difficult concepts. [31]
- **Increased Use of Learning Resources:** The shared problem solutions, visual examples, and simulator resources were frequently accessed and reviewed by students for self-study and exam preparation. [32]

Challenges faced during implementation [33]

- **Time Constraints:** Covering all Theory of Computation topics thoroughly within the limited class hours was challenging, especially when incorporating extensive problem-solving and Q&A sessions. [34]
- **Technical Issues:** Occasional technical difficulties with simulation software or projection equipment disrupted the flow of some sessions. [35]
- **Student Dependency:** Some students tended to rely heavily on presented solutions without actively attempting to solve problems independently, limiting deeper conceptual understanding. [36]

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