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Topic of the Research: A Study of Effectiveness of e-Module in Teaching and Learning
of Mathematical Concepts at Secondary Level

Findings

The study explored the *challenging areas in mathematics teaching and learning*. The major challenges were the portions of geometry, working out a deductive proof, the *formula-rich* content and also involving certain affective domain factors. This can primarily be viewed keeping in mind the prevalent strategies among the students that of rote memorisation and relying on online videos for quick access to solutions. The learners were found to be working at different levels of geometrical thinking. The pedagogical challenges were related to knowledge and understanding domains of learning but teachers' responses primarily involved student related factors.

The *effectiveness of the e-module* was found to be statistically significant. The *role of the e-module* as per the feedback was to provide an enhanced learning environment by involving learners in independent and group discussion-based active learning. The role of the teacher in this scenario would be of a facilitator and not of a primary 'knowledge or information' provider in the classroom. The e-Module can also aid as an effective and efficient tool for a teacher to deal with a diverse group of learners working at different levels of geometrical thinking. The e-Module was also effective in terms of a gamification based assessment tool providing extrinsic motivation to the learners.

The study proposes certain significant implications based on its findings. The policy makers can keep in purview that the in-service teachers need to be provided with training towards

developing and utilising such e-Modules; in-service teacher training programs need to be framed to educate teachers for effectively utilising digital pedagogies; relevant infrastructure facilities need to be provided; such an e-Module can be freely available for teachers and students on government initiated platforms for school education.

Mathematics teacher educators can focus on utilising the Constructionist approach; adequate experiences to utilise such digital pedagogies as part of the teacher education programs particularly during the school internship program.

The curriculum developers can focus on incorporating such e-Modules as a part of the Mathematics Lab Kit and also mathematics textbooks in the form of QR codes and the NCERT textbooks for mathematics need to incorporate more examples and exercise questions.

Mathematics teachers at secondary level need to recognise the challenges faced by the students and the areas posing difficulties to them so as to help them adopt appropriate pedagogies, meaningful learning experiences can be provided through such e-Modules in order to create a learning environment that caters to developing higher order thinking skills. Moreover, the redundant technologies that offer passive participation need to be discarded. Due cognisance of their students' affective domain learning needs is to be taken by the mathematics teachers. e-Modules can be incorporated as a teaching aid for the process of conjecturing and proofs as it offers the scope of an engaging resource to work out proofs, moreover the e-Modules serve as an aid for a constructivist approach to the teaching-learning process. Learning Analytics can be utilised by the teachers as a structured feedback mechanism to improve the teaching-learning process.