# TEACHING COMPETENCY DEVELOPMENT FRAMEWORK FOR SRMIST FACULTY MEMBERS

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## ABSTRACT

In this rapidly changing technological scenario, need for a well-qualified professionals with multidisciplinary abilities will be in greater demand. This requires reforms in education promoting more focus on know–how to solve problems with critical thinking, do multidisciplinary projects with creative thinking and innovate in cutting-edge areas of all disciplines. Since the faculty member plays a key role to maximize student learning experiences and attainment of learning outcomes, the professional development of faculty members must be at the core of the basal reforms in the education system. In SRM Institute of Science and Technology (SRMIST), faculty members are encouraged to participate in professional development programmes and outcome-based education workshops. Since the programmes and workshops offered are mostly at an introductory knowledge level, the expected outcomes couldn't be attained as expected especially at the implementation level. Faculty members at all levels may need to re-skill in respond to new initiatives at institution level and directives from government bodies. Effective use of ICT tools in teaching and learning process by the faculty members is of paramount importance in the current scenario. Hence, it is evident that there is a clear need for professional development framework for faculty members to achieve the desired outcomes. This paper describes the design and development of teaching competency development framework for SRMIST faculty members using ADDIE instructional system design model, TPACK (Technology Pedagogy and Content Knowledge) and UNESCO ICT-CFT (Competency framework for teachers) frameworks. This framework covers the professional, techno-pedagogical and organizational competencies every teaching faculty member should possess.

## KEYWORDS

Professional development, competency framework, ADDIE model, TPACK, UNESCO ICT-CFT, SOLO taxonomy, constructive alignment, Standards: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

## INTRODUCTION

A working group highly proficient in instructional design and educational technology was formed at SRMIST to develop the teaching competency development framework. The group had analysed various instructional design models that many training developers use to

maximize learning experiences. After series of discussion and analysis by the group, ADDIE instructional design model was chosen to design and develop the teaching competency development framework for SRMIST faculty member (Peterson, 2003). ADDIE is an acronym for the five-step process: Analysis, Design, Development, Implementation and Evaluation (Tu, Zhang, & Zhang, 2021).

Effective use of ICT tools in teaching and learning process by the faculty members is of paramount importance in the current scenario. This framework includes the Technology Pedagogy Content Knowledge (TPACK) and UNESCO ICT-CFT (Contemporary Framework for Teachers) model based competencies required by the faculty members to use technologies in services such as understanding ICT in education, curriculum and assessment, pedagogy, application of digital skills, organisation and administration, teacher professional learning and develop learning contents for 21st century learners (United Nations Educational, Scientific and Cultural Organizations, 2019).

The structure of this paper is organized as follows: (a) Needs Analysis (b) Design and Implementation of Framework (c) Implementation and Evaluation of Framework (d) Conclusion.

## NEEDS ANALYSIS

To design a framework, we performed a needs analysis, as shown in Table 1 through preferences from faculty members on competence development using need identification forms, discussion during performance appraisal meetings, academic planning meeting regarding implementation of new initiatives and policies framed by government and institution level, survey questionnaire on faculty skill gap analysis and course/programme exit survey from students (Dervenis, Fitsilis, & Latrellis, 2022).

Table 1. Framework Analysis Methodology

| ADDIE model stage 1 | Process |
|---|---|
| Framework Needs Analysis | New initiatives/policies from government and institution level (National education policy 2020, CDIO) |
| | Existing faculty development programmes and scope of improvements |
| | Faculty member needs analysis |
| | Student needs analysis |

### *Analysis on New Initiatives/Policies from Government and Institution Level*

According to the National Education Policy (NEP) 2020, Government of India, higher education institutions should revise and revamp all aspects of the education structure, including its regulation and governance, to create a new system that is aligned with the aspirational goals of 21st century education, including Sustainable Development Goal (SDG) 4.0, while building upon India's traditions and value systems (Ministry of Human Resource Development, 2020).

SRM Institute of Science and Technology (SRMIST) has adapted CDIO initiative in the year 2021 to create a new education system that is aligned with institute's mission, SDG 4.0, fundamental policies of NEP 2020 for higher education and requirements for accreditation bodies. As per SRMIST CDIO implementation plan shown in Figure 1, the faculty members' technical and teaching competence development is identified as the top priority in the academic year 2021-2022 for successful implementation of CDIO approach in all the engineering programmes and also in all other non-engineering programmes from 2023-2024 academic year onwards.

This analysis gave insight to connect the philosophy of CDIO such as designing CDIO curriculum, providing integrated learning experiences, adapting active and experiential learning strategies, and accessing student learning in this framework. This framework also addresses faculty members' professional competencies including strategic skills, leadership skills, interpersonal skills and technical skills; organizational competencies such as performance skills, modelling skills, development skills and delivery skills; techno-pedagogical skills to meet the requirements specified in NEP 2020.

### *Analysis on Existing Faculty Development Programmes*

The newly joined faculty members at SRMIST are given induction regarding learning outcomes - significance & articulation, educational taxonomies for cognitive, psychomotor & affective domain, active learning pedagogies, assessment techniques and the use of Information and Communication Technology (ICT) learning tools and strategies. From the analysis, it's identified that the existing teaching and assessment methods adopted by the faculty members are not well designed to best achieve the intended learning outcomes. To better achieve the intended learning outcomes, knowledge on Constructive Alignment (CA) approach is included in this framework. CA approach bring forth a framework to align the teaching and assessment to attain the outcomes (Biggs, 2014). Since the SOLO (Structure of Observed Learning Outcomes) taxonomy has more advantages over the other educational taxonomies in the evaluation of student learning and also associates well with the CA, it's been included in the framework (Biggs, & Collis, 1982). SOLO taxonomy makes both teacher and students to progress from surface to deeper constructive learning which are mirrored with its levels such as Pre-structural, Uni-structural, Multi-structural, Relational and Extended abstract.

### *Faculty Member Needs Analysis*

The faculty members' teaching competence development preferences are identified through need identification survey. More than 2,000 faculty members of all levels in engineering, medicine and health sciences, science and humanities, management, law and agriculture programs participated in the survey that identified the competencies needed for development, which are part of the framework. Since the faculty members at senior levels may need to re-skill in respond to new initiatives at institution level and directives from the government bodies, they have actively taken part in this survey. The survey analysis shows that the faculty members would like to acquire more knowledge on the following:

(i) End to end accreditation process
(ii) How to motivate and engage students
(iii) Reflective teaching
(iv) Data driven instruction
(v) Effective ways to maximize learning attainment
(vi) Adult learning strategies
(vii) Conducive infrastructure for implementing active learning strategies

(viii) Teaching using digital technologies
(ix) ICT tools based formative assessment
(x) A common platform to share and learn best practices in teaching core subjects
(xi) Effective integration of simulation/design tools in learning management system (LMS) for teaching and learning
(xii) Instructional material design using ICT tools

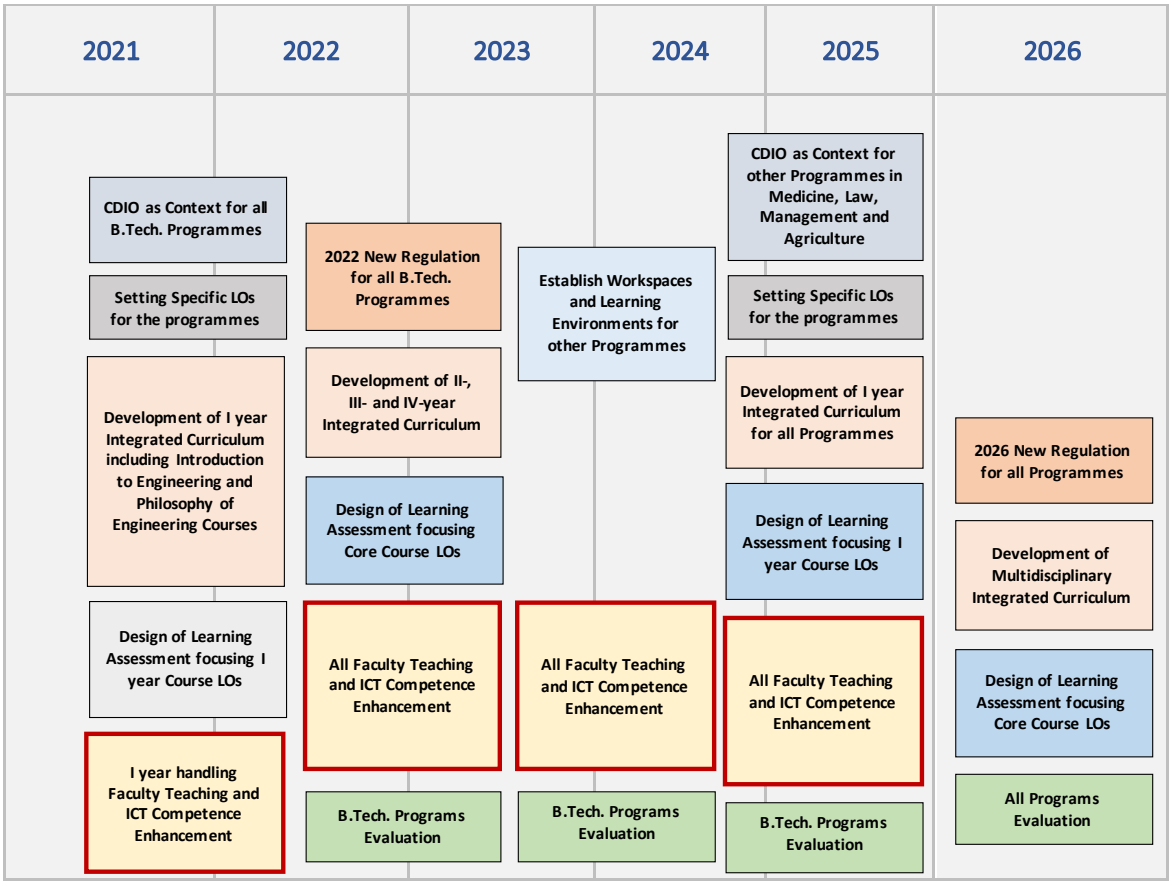


Figure 1. CDIO implementation plan at SRMIST

### *Student Needs Analysis*

The students' expectation on teaching and learning process was analysed through inputs obtained from course and programme exit survey. Students from all disciplines including engineering, medicine and health sciences, science and humanities, management, law and agriculture have taken part in this survey. Through analysis, it's identified that the students in common expect the following requirements in all parts of education system to achieve the learning outcomes:

(i) Multimedia instructional materials
(ii) Creative thinking guidance
(iii) Conducive smart classroom atmosphere
(iv) Multi-disciplinary and flexible curriculum
(v) Teaching and learning with ICT tools

(vi) Blended mode of teaching and learning
(vii) Flipped classrooms
(viii) End to end product design guidance and facility

## DESIGN AND DEVELOPMENT OF FRAMEWORK

The faculty competency development framework's main focus is on determining the science of learning and science of instruction in teaching and learning practices. Before beginning the design process, the expectations from the faculty, students, initiatives by the institution and government obtained through needs analysis process are mapped together to check the correlation. The framework is designed considering the constraints and resources determined through the mapping process.

The major design features include:

(i) Three phases of faculty competence development programmes: Knowledge Acquisition, Knowledge Deepening and Knowledge Creation.
(ii) Articulate learning objectives and outcomes for all the phases of competence development programmes
(iii) Create lessons for each learning outcomes and prepare detailed lesson plan.
(iv) Use of ICT tools in the active learning approach and assessments planned in every learning session of the competence development programmes to maximize the learning experiences.
(v) Application of andragogy and heutagogy principles in all the learning sessions, so that faculty members being the self-directed individuals will make the best of learning journey.
(vi) Incorporation of guided learning, individual and collaborative learning and work based learning approach in each phase of the development programme.
(vii) Assessment of learning through written assignment, quizzes and appropriate evidence submission for work based learning.

The level of ICT competence is increased in each phase of the competence development programme for a better and more robust understanding of the subject matter thus balancing the UNESCO ICT-CFT (Contemporary Framework for Teachers) and TPACK (Technology, Pedagogy and Content Knowledge) frameworks (Mishra, & Koehler, 2006). ICT tools used in these programmes include presentation tools, mind mapping and concept mapping tools, virtual classrooms, whiteboards, collaborative and social learning applications, learning and sharing tools, subject related applications and software, eLearning tools developed by SRMIST (Rajeev, & Vairavel, 2021), audio and visual document development tools, learning content management system, learning management system, computer aided assessment and evaluation and learning analytics tools (Hanson, & Fors, 2009).

### *Development of Learning Phases in the Framework*

In knowledge acquisition phase, the faculty members learn about the fundamentals of outcome-based education, CDIO standards, CDIO curriculum design, application of adult learning theories, active learning strategies, ICT tools used for teaching and learning, formative and summative assessment techniques using ICT tools. Integrated approach is adopted for guided learning sessions (integrating both knowledge and practice) and is better handled through appropriate active learning methods. Mentoring is adopted to guide and support the faculty members to complete the tasks to be submitted as per the programme content in

portfolio. Senior faculty members who is trained on delivery methodologies and assessment procedures that are covered in this framework are assigned as mentor. Experiential learning is promoted by allowing the faculty members to observe the teaching and learning methods adopted by experienced faculty members. Formative assessments are conducted periodically to ensure the learning outcome is attained.

In knowledge deepening phase, as a part of work-based learning, faculty members are encouraged to apply the learning in phase I of the competence development programme in the courses they teach in classrooms. Faculty member prepare a detailed session plan with suitable active learning approach and formative assessments using ICT tools. Mentor allocated to each faculty member will agree upon the objectives before the class session, observe the teaching method adopted during the session, reflect and discuss on teaching method adopted after the session. This learning by doing practice brings a new experience for the faculty members. As a part of individual and collaborative learning, faculty members are encouraged to reflect on their new experience individually and also discuss about feedbacks from the mentor. The faculty member is allowed to collaborate with other members to understand each of their new experiences on the methods adopted. By adopting this do/review/learn/apply method in the program, faculty members construct their own unique personal meanings or understandings of their experiences and this leads to constructivism.

In knowledge creation phase, using modern ICT tools, faculty members are trained to design, develop and format instructional materials, analyze the effectiveness of active learning approach adopted in classroom through student feedback and generate report, do curriculum analysis through data driven techniques. As per the design plan and features, the framework developed for teaching and ICT competence development is shown in Table 2.

Table 2. Teaching Competency Development Framework

| Phases of Competency Development | Approach | Learning Outcomes |
|---|---|---|
| Phase I Knowledge Acquisition | Guided Learning, Individual and Collaborative Learning | Understand the philosophy of Outcome Based Education, new initiative/policies by the government and institute level, accreditation process |
| | | Articulate Programme and Course learning Outcomes |
| | | Self-Evaluate a programme with CDIO Standards |
| | | Design a CDIO Curriculum using mind/concept mapping tools |
| | | Review and Understand Adult Learning Theories |
| | | Understand ICT in education |
| | | Understand the application of Organizational Competencies and |

| | | |
|---|---|---|
| | | Professional Competencies in the given scenario |
| | | Identify Active Learning Strategies for intended learning outcomes |
| | | Design an Effective Lesson Plan with well aligned pedagogical approach and assessment for the intended outcome (Constructive Alignment Approach with SOLO Taxonomy) |
| | | Select and use appropriate Digital Technologies for teaching and assessment |
| Phase II Knowledge Deepening | Guided Learning, Work Based Learning, Individual and Collaborative Learning | Practice the lesson planned in the phase I by integrating ICT tools across teaching, learning and assessment process |
| | | Design and practice a sequence of correlated lesson plans with collaborative and social application supported (eLearning 2.0) project/problem-based learning activities. |
| | | Design and practice Blended Learning approach using varied digital tools to promote higher order thinking and problem-solving skills. |
| | | Reflect about the work-based learning with senior colleague to improve professional practice. |
| Phase III Knowledge Creation | Guided Learning, Work Based Learning, Individual and Collaborative Learning | Design, develop and format instructional design materials using audio and video development tools |
| | | Compute learning outcome attainment using Data-Driven techniques |
| | | Generate report for continuous improvement |

## IMPLEMENTATION AND EVALUATION OF FRAMEWORK

In SRMIST, a teaching developer group is created with senior faculty members above five years of teaching experience volunteered from each department to act as a mentor. The faculty members enrolled in this competency development programme will be mapped with the available mentors who work in the same department to ensure support and effective learning. The mentors have qualities such as genuine desire to be personally involved, ability to communicate, empower others, professionalism and supportiveness that are required for this competency development programme.

This three phases of teaching competency development programmes are successfully completed in the year 2022. Initially 60 faculty members including all levels were trained with the support of the mentors. At the end of the training, the faculty members are assessed through an ePortfolio of evidence, submitted to a team of internal experts using learning management system. Assessment of learning is evaluated through written assignment, quizzes and appropriate evidence submission for work based learning in their respective ePortfolio. Based on the evaluation of the learning outcomes attainment and collective feedback from the mentors, the delivery methodologies were corrected in appropriate sessions to maximize the learning experiences. The trained faculty members are assigned as a mentor for the next cohort of faculty members to get trained. So far 200 faculty members from all disciplines are trained effectively. The learning experiences shared by the trained faculty members is really encouraging. The summary of the feedback given by the faculty members trained in this competency development programmes is shown in Figure 2. The performance indicators considered for analysis are usage of effective Active Learning Methods (ALM), appropriate Learning Content and Resources (LCR), ICT tools and different Assessment Methods (AM) in the training. The analysis in Figure 2 shows more than 50 percent of the faculty members have given excellent for ALM, LCR and ICT, very good in the range from 11 to 46 percent for all the four indicators. Below 50 percent have given excellent for assessment methods used which is considered for improvement by including more varieties of assessments in the upcoming training.

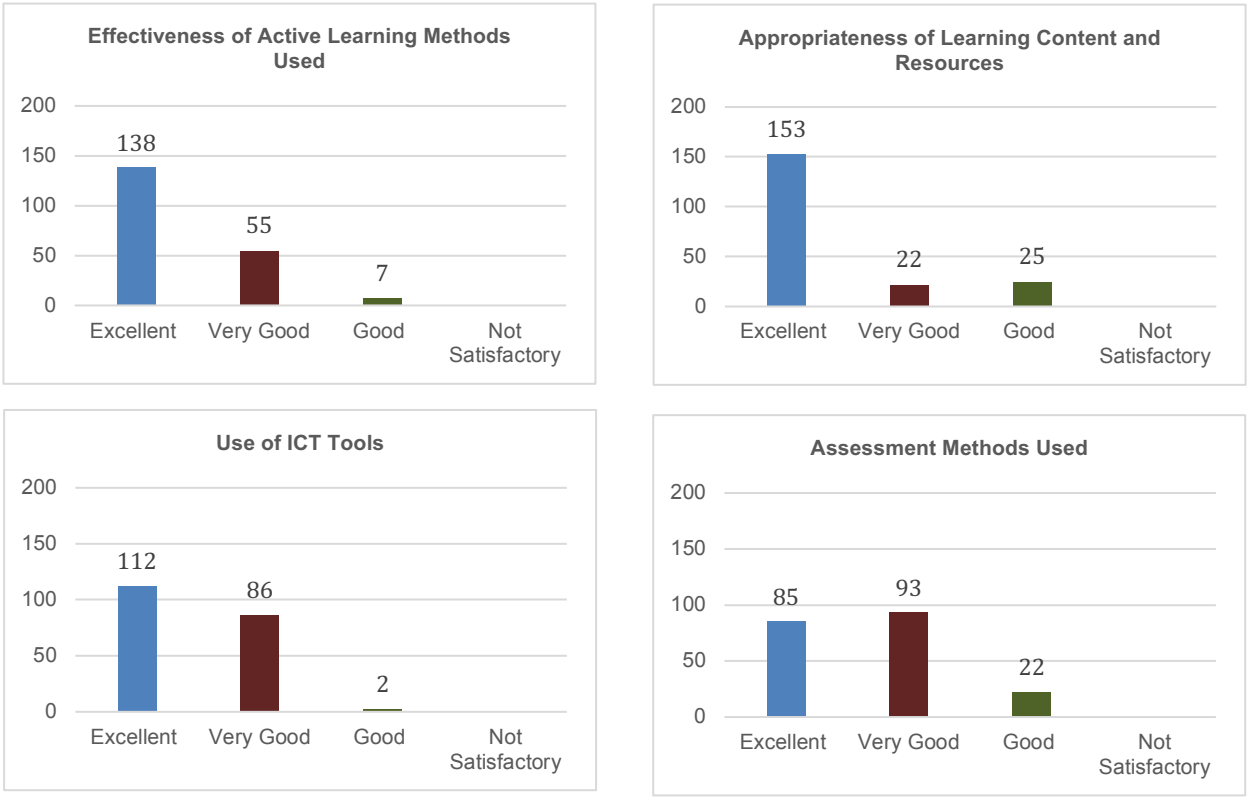


Figure 2. Feedback Analysis

## LIMITATIONS AND CHALLENGES

The limitations and challenges encountered during the development of this framework are extensive analysis of the data collected from 40000 plus students and 2000 plus faculty members from different disciplines and mapping all the expectations in the different phases of learning in the framework.

## CONCLUSION

In SRMIST, CDIO curricula framework is adapted for all the undergraduate engineering programmes incompliance with the programme learning outcomes defined by the accrediting bodies. This new curriculum revision is effectively implemented from the academic year 2022 – 2023 onwards. Having implemented the curricula revision, now we need to analyze how effectively the integrated course content is delivered by the faculty members and how these competencies developed through this framework maximizes the students learning. The effectiveness of delivery will be analyzed through student feedbacks on teaching-learning methodology adopted by the faculty for the course. The learning effectiveness will be analyzed through evidences of learning, direct and indirect attainment of student outcomes in comparison with the last years student outcomes attainment. The establishment of the teaching competency development framework supports the CDIO curriculum framework and provides guidance for the faculty members throughout their career. As a part of continuous improvement of the programme, suitable skills and areas of improvement will be identified and enhanced in the future. This broad goal is to maximize the students' learning experiences, attainment of learning outcomes, higher order thinking skills and make them industry ready engineers.

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