WEB OF SCIENTIST: INTERNATIONAL SCIENTIFIC RESEARCH JOURNAL
ISSN: 2776-0979, Volume 6, Issue 5, May- 2025

SMART SKILLS ENGINEERING COMPETENCIES OF TEACHERS

Morkhova Inessa Vyacheslavovna
PhD, Associate Professor, Department of General Pedagogy,
National Pedagogical University of Uzbekistan named after Nizami

Abstract
The demands of the 21st-century educational landscape have transformed the traditional role of teachers, especially in the context of engineering and technical education. This article examines the integration of SMART (Specific, Measurable, Achievable, Relevant, Time-bound) skills within the framework of engineering competencies required for modern teachers. Emphasis is placed on the development of digital fluency, problem-solving abilities, and adaptive learning strategies. The paper also highlights how SMART-based pedagogical design enhances teaching efficacy, learner engagement, and long-term professional development in STEM fields.

Keywords: SMART skills, engineering competencies, teacher development, STEM education, pedagogy.

INTRODUCTION

The rapid technological advancements of the 21st century and the increasing complexity of educational needs have redefined what it means to be an effective teacher—particularly in technical and engineering disciplines. Modern educators are no longer mere transmitters of knowledge; they are facilitators, designers, analysts, and lifelong learners. In this context, the integration of SMART skills with engineering competencies has emerged as a key strategy for ensuring that teachers can effectively prepare students for dynamic and innovation-driven work environments. SMART skills offer a structured, outcome-oriented approach that aligns teaching goals with real-world expectations, while engineering competencies emphasize analytical reasoning, technical adaptability, and innovation. When combined, they foster a new paradigm of teaching that is both methodical and agile.

MATERIALS AND METHODS

Information and Communication Technologies (ICT) has become a part and parcel of our lives for the last few decades. Each and every aspects of life are related to science and technology. Education system is not out of this. Use of technology in education has increased due to COVID-19 pandemic situation. It helps to improve the quality of

education by bringing progressive change in the entire teaching and learning system. Educational system has faced new dimension dominated by e-learning. The various kinds of ICT products available having relevance to education and serving different purposes, include teleconferencing, email, audio conferencing, television lessons, radio broadcasts, interactive radio counselling, interactive voice response system, group text messaging, group audio messaging, file transferring, learning apps etc.

The foundation of SMART skills lies in their ability to convert abstract objectives into actionable steps. For teachers in the engineering domain, this means being able to set clear learning goals (Specific), assess student progress using quantifiable indicators (Measurable), design realistic lesson plans (Achievable), align content with industry needs (Relevant), and adhere to structured timelines (Time-bound). These principles are especially critical in engineering education, where outcomes must be directly applicable to technical tasks and problem-solving scenarios. For example, when teaching circuit analysis or CAD design, a teacher's SMART-aligned approach ensures that the objectives are not just about "learning a topic" but about performing specific tasks, demonstrating proficiency, and applying the knowledge to real-world projects.

RESULTS AND DISCUSSION

In terms of competencies, engineering educators are expected to possess a wide range of professional skills, including technical expertise, project management, innovation capability, and collaborative communication. These competencies extend beyond the classroom and require constant interaction with industry practices, research developments, and technological tools [1, 2]. SMART skills serve as a scaffold to develop and measure these competencies systematically. For instance, a teacher tasked with introducing 3D modeling software can use SMART criteria to structure the learning sequence—from downloading and installing the program, understanding the interface, creating basic objects, and completing a full-scale design within a defined timeline.

Digital literacy is a cornerstone of both SMART skills and engineering competencies. Engineering educators must not only be proficient in using educational technologies but must also be capable of integrating them meaningfully into the curriculum. Learning Management Systems (LMS), virtual laboratories, data visualization tools, and coding platforms all require a level of technical fluency that extends beyond basic computer skills. SMART goals help ensure the gradual and targeted acquisition of such technologies, enabling teachers to stay current and maintain instructional relevance.

Moreover, SMART-based instruction supports the development of higher-order cognitive skills, such as critical thinking, synthesis, and design-based reasoning—hallmarks of engineering education [3]. By framing lessons within clear and time-bound challenges, students are encouraged to apply their learning in complex, multifaceted tasks that reflect real engineering problems. Teachers, therefore, must be able to engineer not only knowledge delivery but also the learning environment itself—one that is dynamic, inquiry-driven, and iterative.

Another key competency lies in collaborative learning facilitation. Engineering projects are rarely completed in isolation; they require coordination, delegation, and peer feedback. Teachers must therefore be skilled in orchestrating teamwork, managing group dynamics, and promoting accountability among students. Setting SMART goals for team-based assignments allows teachers to monitor group progress, intervene when necessary, and ensure equitable participation. This approach mirrors the collaborative nature of modern engineering workplaces.

Finally, the continuous professional development (CPD) of engineering teachers must itself be driven by SMART strategies. Goal-setting for skill upgrades, participation in MOOCs, attendance at industry conferences, and engaging in action research should all follow the SMART model to ensure effectiveness. Institutions that adopt this approach often see improved teacher performance, increased innovation in teaching methods, and better student outcomes in technical programs [4].

A particularly underexplored yet vital intersection between SMART skills and engineering competencies lies in data-driven decision-making and analytical assessment practices. Engineering educators increasingly need to engage with student performance metrics, feedback systems, and digital assessment tools that generate real-time data on learner progress. Applying SMART frameworks allows teachers to not only define measurable learning outcomes but also interpret data in ways that directly inform instructional improvement. For instance, a teacher tracking student mastery in a robotics module may establish a SMART goal to improve troubleshooting success rates from 60% to 80% over a three-week design sprint. Through the use of digital rubrics, performance dashboards, and learning analytics platforms, the teacher can identify specific skill gaps, reallocate instructional time, or personalize feedback—all actions grounded in data literacy. This analytical competency reflects a broader trend in engineering education toward evidence-based pedagogy, where instructional choices are justified through empirical results rather than intuition alone [5]. Moreover, the ability to collect, analyze, and respond to performance data prepares teachers to align their work with accreditation standards, industry benchmarks, and

institutional quality assurance systems—each of which increasingly demand transparent, outcomes-focused reporting.

CONCLUSION

The integration of SMART skills with engineering competencies marks a significant evolution in teacher professionalism. It bridges the gap between instructional practice and industry expectation, equipping educators with the tools they need to remain effective in rapidly changing environments. Engineering teachers must not only master content but also continuously refine their strategies, technologies, and interpersonal abilities. SMART frameworks provide the clarity and direction needed for this ongoing development. In doing so, they contribute to a more purposeful, impactful, and future-ready engineering education system—one that empowers both teachers and learners to excel in the age of innovation.

REFERENCES

1. Bloom, B. S. (2016). Taxonomy of Educational Objectives: The Classification of Educational Goals. New York: Longmans, Green.
2. Wiggins, G., & McTighe, J. (2015). Understanding by Design. Alexandria, VA: ASCD.
3. Darling-Hammond, L. (2010). The Flat World and Education: How America's Commitment to Equity Will Determine Our Future. New York: Teachers College Press.
4. European Commission (2020). Digital Education Action Plan 2021–2027. Brussels.
5. Kolmos, A., de Graaff, E., & Du, X. (2009). Research on PBL Practice in Engineering Education. Rotterdam: Sense Publishers.