A Bird's Eye-View of MOOCs for Pedagogical Knowledge and Technical Skills Development of Teachers in India

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ABSTRACT

The present study reviews online courses on the E-Learning Platform - Study Webs of Active Learning for Young Aspiring Minds (SWAYAM) for teacher education in India. Online education, E-Learning and MOOCs attracting learners and the initiative of SWAYAM is taking the lead in providing for a free platform for students and working professionals across the country teacher education and continuous professional development. The current study aims at looking at the courses on Teacher Education to get a birds' eye-view of courses and in particular explore the courses for Pedagogical Knowledge and Technical skills development of teacher. This study also tries to explore courses that have innovative teaching approaches that are being offered to improve the ability of teachers to cater to 21st century skills. This study implies content analysis method for courses offered on SWAYAM for teacher education. It analyses the title and contents of courses designed to improve pedagogical knowledge and technical skills among teachers in the June 2024 semester. The PRISMA model was used to collect, screen and select course which led to 57 courses that were found suitable for the study and a review of the basic content available was conducted. Findings reveal that the number of courses and participant enrolment is higher in Technical skills course as compared to Pedagogical Knowledge development courses. Findings reveal that teachers prefer technical skills courses as against courses on pedagogical knowledge development. The learner enrolment is higher in courses with lower duration indicating that the duration of the course affects the decision of the learners for enrolment. The study also found a lack of courses on Innovative teaching approaches and Artificial Intelligence in Education. It is recommended to create bite-sized courses on new teaching methods with hands-on practice for courses on technology integration.

Keywords: Teacher Education, E-Learning platform, Pedagogical Knowledge, Technical Skills, SWAYAM

INTRODUCTION

Education is undergoing a massive transformation in the digital age, notably in India, where new strategies are necessary to reach the large and diverse population. An E-Learning platform was set up by the government of India under the Ministry of Education aiming to achieve three cardinal principles of access, equity and quality. This initiative is named as Study Webs of Active Learning for Young Aspiring Minds (SWAYAM). It has evolved into a major project to democratize education by offering free and low-cost online courses. It serves learners from many backgrounds, including students, working professionals, and educators, allowing them to upskill and remain relevant in their respective professions (Gulati et al., 2021).

India's National Education Policy (NEP) 2020 emphasizes the necessity of incorporating innovation into education, with a focus on skill-based education and inclusion. Kumari (2024), noted that SWAYAM supports these objectives by providing courses that not only improve subject matter expertise but also promote the

didactic and technical abilities required. According to Adhikari et al. (2021), SWAYAM's flexible and multilingual courses appeal to a broad audience, from pre-service instructors to experienced teachers, allowing professionals to readily adjust to the changing academic needs.

The increasing use of SWAYAM is indicative of a broader trend in educational institutions towards digitization (Adhikari et al., 2021). The platform offers a wide range of free, online courses tailored to educators' needs, covering various aspects such as pedagogy, content knowledge, and technology (Shewale, 2021). The platform offers independent, credit-based. certification system to enhance students' professional credentials. The platform's validity is further reinforced by partnerships with prestigious academic institutions and universities, which ensure alignment with educational standards; (Sikarwar et al., 2022). However, barriers like limited digital literacy, inadequate internet connectivity, and ignorance of accessible courses remain significant barriers for many potential students, particularly in rural and semi-urban areas (Razia, 2019). Ten Institutions are appointed as National coordinators to design, development, production and delivery the courses. The 10 National Coordinators are as follows along with the area of course delivered:

Table 1: List of National Coordinators on SWAYAM and courses offered

Sl No	National Coordinator	Courses Offered
1	All India Council for Technical Education (AICTE)	Self-paced and international courses
2	National Programme on Technology Enhanced Learning (NPTEL)	Engineering
3	University Grants Commission (UGC)	Non-Technical post-graduation education
4	Consortium for Educational Communication (CEC)	Under-Graduate education
5	National Council of Educational Research and Training (NCERT)	School Education
6	National Institute of Open Schooling (NIOS)	School Education
7	Indira Gandhi National Open University (IGNOU)	Out-of-school students
8	Indian Institute of Management, Bangalore (IIM-B)	Management Studies
9	National Institute of Technical Teachers Training and Research (NITTTR)	Teacher training program
10	Institutes of National Importance (INI)	Non-Technical Course

These ten National Coordinators host courses which include 4 major sections – 1) video lecture, 2) downloadable reading material specifically prepared for the course, 3) Tests and Quizzes for self- assessment and 4) Forum for online discussion. Resources include audio-Video, Multimedia and state of the art pedagogy and technology which enriches the learning experience.

Among the vast literature available with extensive studies conducted on Awareness of the platform, a study conducted on Education Courses on SWAYAM by Anuva Samanta (2018) revealed that only 12 courses were available at that time. Another study examined the Impact of MOOC in Teachers' Education but only focused on one course '"ICT in Teaching and Learning" (Mathai, 2019) and a study with training for teacher on assessments (Giri et al., 2022). With limited research and literature about the courses for teachers, it has become the need to understand the scenario of teacher education courses with a bird's eye view. Hence this study aims in answering the following research questions:

Research Questions:

1. What are the courses offered for teacher education by national coordinators, level of study, content areas and course duration on SWAYAM?

2. What are the courses offered for Pedagogical knowledge development of teachers on SWAYAM?
3. What are the courses offered for Technical Skills development of teachers on SWAYAM?
4. Does the course duration influence the number of enrolments for courses offered for Pedagogical Knowledge development of teachers on SWAYAM?
5. Does the course duration influence the number of enrolments for courses offered for Pedagogical Knowledge development of teachers on SWAYAM?
6. What is the difference in the number of courses and learner enrolment between Pedagogical Knowledge and Technical Skills courses offered on SWAYAM?
7. Are there any courses offered on integration of Innovative Teaching Approaches on SWAYAM?

REVIEW OF LITERATURE

A. Role of SWAYAM in Teacher Education in India

SWAYAM has been a major contributor towards lifelong learning by eliminating the barriers to access education, both for students and educators (Rajasekar, 2020). The platform offers a wide range of courses, including vocational training, which is crucial for skill acquisition in rural communities (Hans, 2024). It has transformed conventional teaching and learning approaches and promoted the digitalization of education, which is essential in the current era (Yadav & Yadav, 2024).

SWAYAM's accessibility allows teachers from diverse educational backgrounds to enhance their skills at their own pace, thereby addressing gaps in traditional teacher education (Mathur et al., 2021). By offering courses on pedagogy, assessment, and subject-specific content, SWAYAM ensures that teachers stay up-to-date with the latest educational trends and best practices (Kumari, 2020). As a result, it supports teachers by providing free or low-cost access to high-quality educational resources, enabling teachers from diverse backgrounds to participate in professional development (Lahiry, 2019).

The platform enables lifelong learning, credit transfer, and career advancement for aspiring and in-service teachers across India (Mathai, 2019). It plays a crucial role in helping teachers improve their skills and knowledge, thereby contributing to better educational outcomes in India (Moudgalya, 2020). Furthermore, it addresses challenges in teacher training by ensuring broader reach and effective learning opportunities for aspiring educators (Ghosh, 2020). It also aids teachers in adapting to modern educational practices within India's digital education framework (Jana & B Smrity, 2021) and supports professional development by aligning with its objective to deliver education to less advantaged groups in India (Agnihotri & Pandit, 2021).

As an e-learning platform, SWAYAM provides an ideal space for the dissemination of teacher education by aligning with UGC guidelines. It emphasizes the importance of MOOC courses for teacher qualifications, thereby bridging gaps in digital knowledge and promoting educational equity (Panda et al., 2019). Most of these teacher education courses available on SWAYAM further focus on improving teaching competencies such as technology in teaching (Gundugol & Yadav, 2021). The flexibility of these courses allows for self-paced learning, accommodating a diverse array of educators across the country (Kim, 2020). Yet, it is important to reflect on whether these courses truly engage with contemporary developments in pedagogic thought, and whether they provide an appropriate response to the current need for innovative teaching skills (Patel, 2020) (Azhar & Rashid, 2024).

THEORETICAL UNDERPINNINGS

Pedagogical Knowledge

The development of teachers' pedagogical knowledge is crucial for enhancing educational effectiveness and

ensuring that teaching practices align with learning objectives. This knowledge encompasses various dimensions, including planning, content understanding, and the integration of technology. Pedagogical Knowledge (PK) is a foundational element of teacher professionalism, integrating subject matter knowledge with pedagogical strategies.

According to Zhu and Wang (2020) development of PK is influenced by practical experiences, peer communication, and reflection on teaching practices. They also highlight that teachers develop pedagogical knowledge through educational practice, improving their understanding of pedagogical strategies, student knowledge, subject matter, and environmental contexts—factors influenced by peer communication, experienced teachers, teaching experience, reflection, and personal observation.

Pedagogical knowledge development involves mastering teaching methods, understanding student learning processes, and applying cognitive, social, and developmental theories in the classroom. Teachers enhance this knowledge through reflection, collaboration, and professional development, ultimately improving their teaching effectiveness and student engagement (Ginting & Linarsih, 2022).

A study by Mateka et al. (2024) notes that professional development programs significantly enhanced teachers' pedagogical knowledge (PK), shifting their approach from traditional to constructivist methods, improving their teaching skills, and integrating contemporary teaching strategies.

B. Integration of Technology in Pedagogical Knowledge

The integration of technology into teaching practices has led to the development of the Technology Pedagogical Content Knowledge (TPACK) framework. TPACK emphasizes the interplay between technological knowledge, pedagogical knowledge, and content knowledge. This framework suggests that teachers need to develop competencies in seven key areas: technological knowledge, pedagogical knowledge, content knowledge, technological pedagogical knowledge, technological content knowledge, pedagogical content knowledge, and technological pedagogical content knowledge (Ginting & Linarsih, 2022).

Professional development programs that focus on TPACK can help teachers integrate technology into their pedagogical practices effectively. These programs often involve hands-on experiences, peer collaboration, and reflective practices, which are essential for developing the complex knowledge and skills required for technology-enhanced teaching (Ginting & Linarsih, 2022).

The TPACK framework can be effectively integrated into teacher education programs by incorporating collaborative, practical, and reflective training approaches, as demonstrated in the study, which significantly improved teachers' TPACK through real-world practices and self-reflection (Rahayu et al., 2024). Effective integration of the TPACK framework into teacher education programs requires ongoing professional development, adequate technological resources, and a supportive school culture that promotes collaboration and experimentation, ultimately enhancing educators' ability to create engaging learning experiences tailored to diverse student needs (Mgeladze et al., 2024).

METHODOLOGY

This study follows a content analysis of available data exploring and analyzing the courses offered in the Discipline of Education on the SWAYAM platform. Content analysis is conducted to evaluate the state of knowledge on a particular topic or identify gaps in research and help discuss a particular matter. This study aims to analyses the courses following the PRISMA (Moher et. Al, 2009) method of collecting data for the content analysis. The updated PRISMA diagram by Page et al. (2021), was used for data collection
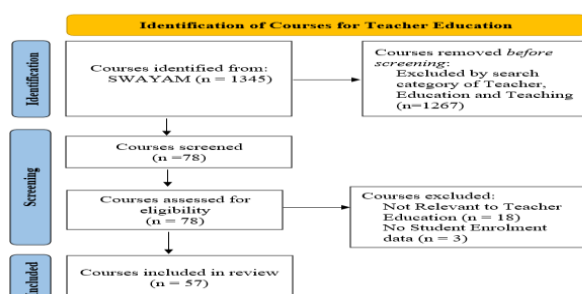

Figure 1: *PRISMA* Diagram for data collection

The data was collected from SWAYAM website during November 2024, where the total number of courses offered for July 2024 term is 1345. Data has been collected from course in the category of Teacher Education. Data from all course which are Ongoing (Enrolment Closed) were collected. The data is as collected on November 14' 2024. The data base was search by using keywords, "Teaching" AND "Education" AND "Teacher". A total of 78 courses were selected and screened leading to exclusion of courses due no learner enrolment data (N=3) and course not relevant to Teacher Education (N=18). Courses offered only in English language were included in the study. Finally, 57 courses were found to relevant based on the inclusion and exclusion criteria for analysis in this study as shown in PRISMA diagram in Figure 1.

Findings and Discussion

The significance of understanding the content of the courses lies in the fact that teacher education is foundational to the quality of education that students receive. Teachers equipped with innovative teaching skills are better able to engage students, foster critical thinking, and create an inclusive and dynamic learning environment (H. L. Sharma and Priyamvada, 2022). As a result, the courses available on SWAYAM can have a profound impact on shaping the future of education in India (Bordoloi et al., 2020). By analysing the teacher education courses offered on the platform, this study seeks to explore whether these courses include essential content related to innovative teaching practices and whether they are structured to enhance the pedagogical and technical competencies of teachers (Sharma & Ghosh, 2023). The lack of availability of relevant research on the Teacher Education courses and in particular the development of Pedagogical Knowledge and Technical skills of teachers lead to this study. Hence, an updated analysis of the new courses for teacher education specific to Pedagogical knowledge and technical skill development is required. This study will focus on analysis of these courses and potential impact on Teacher Education. This study will help in understanding how SWAYAM has played a role in enhancing the teaching skills of teachers to adapt to the changing educational landscape of India.

5.1 Courses by National Coordinators

The contributions made by National Coordinators in providing online courses for Teacher Education were analysed and the same is presented in Table 2.

Table 2: Courses by National Coordinators

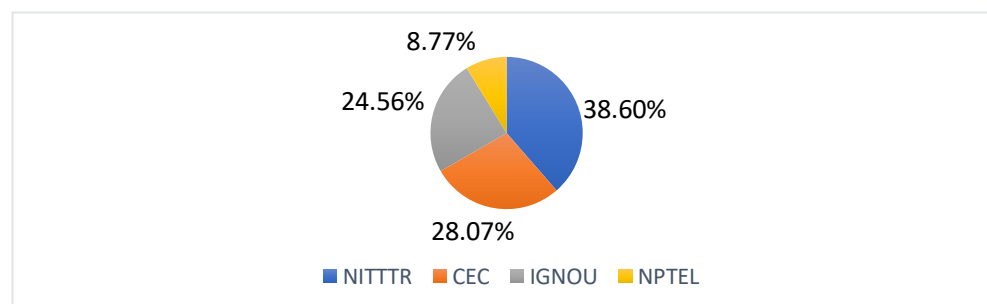| Sl No	National coordinator	Number of Courses	Percentage
1	NITTTR	22	38.60%
2	CEC	16	28.07%
3	IGNOU	14	24.56%
4	NPTEL	5	8.77%

Figure 2: Courses by National Coordinators

Table 2 and Figure 2 above provides for a detailed analysis of contributions National Coordinators in designing and producing Online Teacher Education courses. It is found that a total of only 4 of the 10 National Coordinators have designed and offered courses on the platform. NITTTR has the most contributions with 22

courses (38.60%). Followed by CEC institutions with 16 Courses (28.07%) and IGNOU with 14 courses (24.56%) and lastly NPTEL institutions with 5 course (8.77%). It can be noted that although only NITTTR focuses on Teacher Training programs at its core, other National Coordinators have contributed significantly towards teacher's professional development collectively with a total number of 35 courses (61.40%).

Courses by Level of Education

The courses offered by level of education for teacher development on SWAYAM were analysed and the same is given in Table 3.

Table 3: Courses by Level of Education

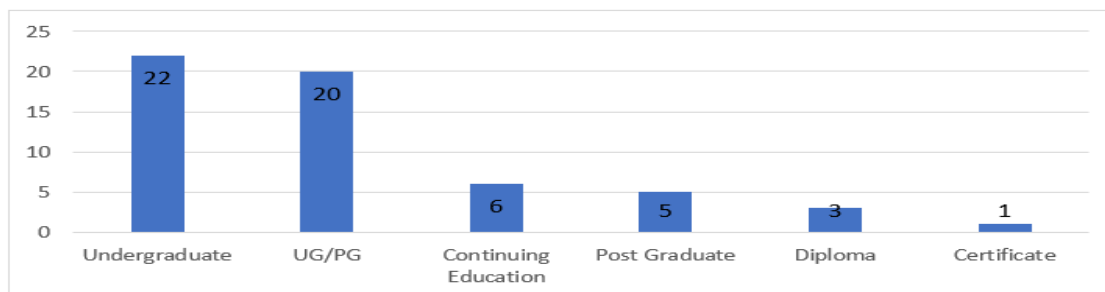| Sl No	Level of Education	Number of Courses	Percentage
1	Undergraduate	22	38.6%
2	UG/PG	20	35.1%
3	Continuing Education	6	10.5%
4	Post Graduate	4	7.0%
5	Diploma	3	5.3%
6	Certificate	1	1.8%
	Total	57	

Figure 3: Courses by Level of Education

Table 3 and Figure 3 provide for analysis of courses that are offered based on the level of education. It can be noted that there are 5 levels that have been identified for Teacher Education, which are 1) Certificate, 2) Diploma, 3) Continuing Education, 4) Undergraduate, and 5) Post Graduate. While most of the courses have been categorized clearly in these levels some of the courses have been identified to be provided both at the Undergraduate and Post Graduate level (N=20, 35%). This categorization of UG/PG makes it more open and suitable for both the levels. However, the courses at the Undergraduate level are higher (N=22, 38.6%) as compared to Post graduate level (N=4, 8.8%). It can also be noted that contributions have been made for courses at the Diploma level (N=3, 5.3%) and Certificate level (N= 1, 1.8%). A separate level and category of Continuing Education (N=6, 10.5%) can be noted among the courses which suggests that there have been efforts to providing Continuous Professional Development for Teachers via SWAYAM.

Courses by Content Area

The courses were coded and categorized based on the content areas covered, as presented in Table 4. The coding was derived from the modules as published on the platform, and categorized by the researchers.

An analysis of the course contents was done to identify and code the courses. It was found that courses were offered aiming at 9 different content areas. As per the data in Table 4 and Figure 4, the largest number of courses were on Technology (N=15, 26.3%), which shows the importance given to driving technology into

teaching and providing for ample opportunities for teachers to adapt to a technology driven teaching approach. It is followed by Psychology (N=13, 22.8%) and Pedagogy (N=10, 17.5%) which suggests the importance laid on the student-centeredness and instructional aspects of teaching. Along with these, courses are also offered on General Education (N=7, 12.3%), Leadership (N=4, 7%), Special Education (N=4, 7%), Language Education (N=2, 3.5%), Sociology (N=1, 1.8%) and Policy (N=1, 1.8%). Courses with diverse content areas suggest that efforts have been made to address multiple areas within the Education arena providing for a broader coverage of content. Alongside, it was found that the time allotment for courses amounted to an overall 572 weeks, among which duration of courses on Psychology gathered the most weeks (N=148, 25.8%), closely followed courses on Technology (N=140, 24.4%) and Pedagogy (N=99, 17.3%). It is also found that although courses on Sociology and Policy both have only one course, the duration of Sociology is higher (N=15, 2.6%) than Policy (N=4, 0.6%). The difference in the duration of the courses shows the importance that has been placed at both ends.

Table 4: Content Areas of Teacher Education courses

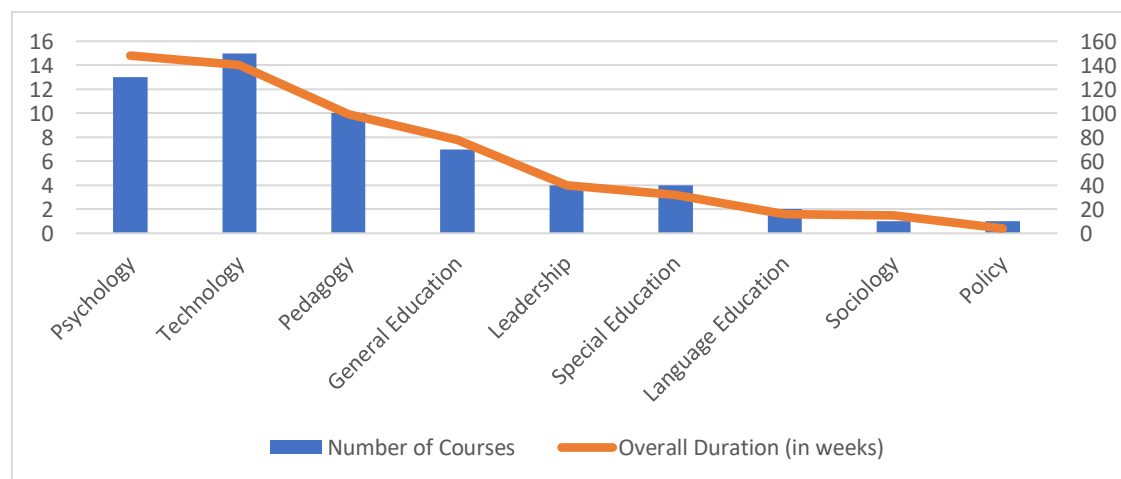| Sl No	Content Area	Number of Courses	Overall Duration in weeks
1	Psychology	13	148
2	Technology	15	140
3	Pedagogy	10	99
4	General Educaiton	7	78
5	Leadership	4	40
6	Special Education	4	32
7	Language Education	2	16
8	Sociology	1	15
9	Policy	1	4
	Total	57	

Figure 4: Content area of courses with duration

Pedagogical Knowledge Courses

A review of the courses aimed at developing teachers' pedagogical knowledge was conducted by analysing the titles and outlines. The efforts made by national coordinators to provide opportunities for pedagogical knowledge development through these courses were examined. Ten courses from the Pedagogy category were analyzed based on the level of education, learner enrolment and duration. The findings are presented in Table 5.

Table 5: Courses for Pedagogical Knowledge development of Teachers

| Sl No	Content Area	Learners Enrolled	Level UG/PG	Duration in weeks
1	Accreditation And Outcome Based Learning	6852	UG	8
2	Basic Instructional Methods	4257	UG/PG	4
3	Advanced Instructional Methods	3125	UG/PG	4
4	Designing learner-centric e-learning in STEM disciplines	1079	UG/PG	4
5	Design Thinking for Educators	900	UG/PG	8
6	BES-143: Pedagogy of Mathematics	522	UG/PG	16
7	Design and Facilitation of E-Learning Courses	512	Diploma	12
8	MDE-412: Instructional Design	314	PG	16
9	Innovation in Laboratory Instruction - Infrastructure Material Laboratory	77	UG/PG	12
10	e-Assessment	38	PG	15
	Total	**17676**		
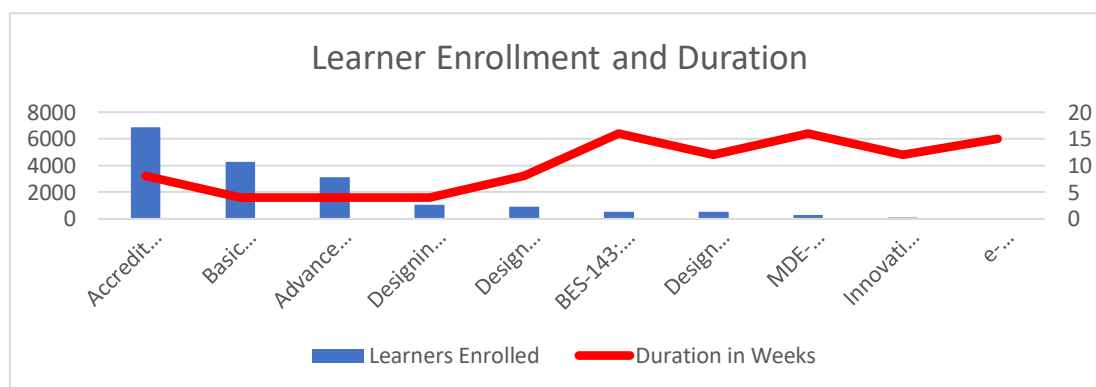
Figure 5: Learner Enrolment and duration of Pedagogical Knowledge courses

In Table 5, it is found that among the 10 courses and 17676 enrolled learners, courses aimed at pedagogical knowledge development of teachers are mostly at the Post graduate level (N=8) and Undergraduate level (N=7), except for one course, "*Design and Facilitation of E-Learning Courses*" which is at the Diploma level.

Analysis of the courses shows that largest number of learners were enrolled in the course "*Accreditation And Outcome Based Learning*" (N=6852, 38.7%), followed by "*Basic Instructional Methods*" (N=4257, 24%) and "*Advanced Instructional Methods*" (N=3125, 17.6%). These three courses collectively have an enrolment of 14234 learners making up to 80% of the learners. However, it is noted that the duration of the course is 8 hours, 4 hours and 4 hours respectively which is the lowest duration among the 10 courses. At the other end,

course with least learners enrolled is *"e-Assessment"* (N=38, 0.21%) and closely followed by *"Innovation in Laboratory Instruction - Infrastructure Material Laboratory"* (N=77, 0.43%).

It is noted that courses with longer durations have low learner enrolment such as *"MDE-412: Instructional Design"* (N=314, 1.77%), with duration of 16 weeks. On the contrary it is found that courses with shorter duration have higher learners enrolled such as *"Basic Instructional Methods"* (N=4257, 24%), with duration of 4 weeks and *"Advanced Instructional Methods"* (N=3125, 17.6%) with duration of 4 weeks. This difference in learner's enrolment shows that learners are more drawn towards the duration of course completion.

Technical Skills Courses

A review of the courses related to the development of technical skills for teachers was conducted based on the course titles and outlines. Fifteen courses were identified as aiming to provide opportunities for teachers to develop skills in technology integration within the teaching-learning process. These courses are suitable for teachers, instructors, and faculty at all levels. A detailed analysis of the courses is presented in Table 6.

Table 6: Courses for Technical Skills development of Teachers

Sl No	Content Area	Learners Enrolled	Level UG/PG	Duration in weeks
1	Internet of Things: Design Concepts and Use Cases	7617	UG/PG	8
2	3D Printing and Design for Educators	6975	UG/PG	8
3	Graphics and Animation Development	3285	UG/PG	8
4	ICT in Teaching and Learning	2329	UG/PG	4
5	E-content Development	2225	UG/PG	8
6	ICT Skills in Education	2190	UG	12
7	BESE-141- ICT in Education	2105	UG	16
8	Educational Media	2068	UG/PG	4
9	Educational Technology	1359	UG	8
10	Educational Video Production	1252	UG/PG	4
11	Virtual simulation tools based Interactive Teaching and Learning Strategy	690	CE	8
12	Virtual Education	429	CE	8
13	Introduction to Distance and Digital Education	160	UG	12
14	Media and Information Literacy for Teachers	102	UG	16
15	Selection and Integration of Technology in Educational Processes	77	Diploma	16
	Total	**32863**		

Table 6 presents the details of the course that are aimed at technical skills development of teachers. It is to be noted that among the 15 courses with 32863 learners enrolled, most of the courses are for the Undergraduate level (N=12), followed by Post graduate level (N=7). Also, courses aimed at Continuing Education (N=2) and Diploma (N=1) find presence in the Technical Skills category.
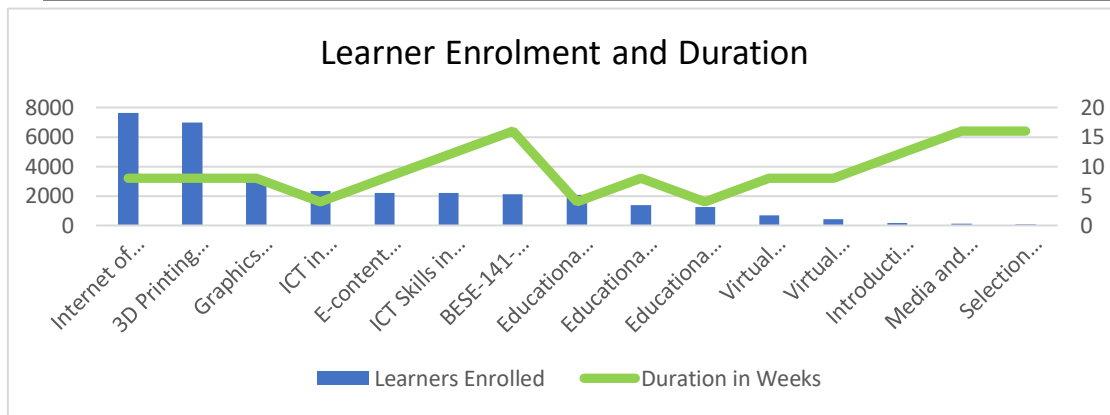
Figure 6: Learner Enrolment and duration of technical Skills courses

The total number of learners enrolled in the 15 courses are 32863, which demonstrates a significant interest in technical skill development among teachers. The course with the highest enrolment is *"Internet of Things: Design Concepts and Use Cases"* (N=7617, 23.1%), followed closely by *"3D Printing and Design for Educators"* (N=6975, 21.2%). In contrast, the least-enrolled course is *"Selection and Integration of Technology in Educational Processes"* (N=77, 0.2%). Courses with longer duration of 16 weeks are found to have lower enrolments such which include *"BESE-141- ICT in Education" (N=2105, 6.40%), "Media and Information Literacy for Teachers*" (N=102, 0.31%) and " *Selection and Integration of Technology in Educational Processes* " (N=77, 0.2%), indicating that extended time commitments may impact participation. Courses like *"Internet of Things"* (N=7617, 23.17%), *"3D Printing and Design for Educators" (*N=6975, 21.22%), and *"Graphics and Animation Development*" (N=3285, 9.99%) attract high enrolment, indicating an increasing interest in integrating emerging technologies into teaching practices. The enrolment in virtual education courses, such as *"Virtual Simulation Tools-Based Interactive Teaching and Learning Strategy"* (N=690, 2.09%) and "*Virtual Education"* (N=429, 1.30%), reflects a modest yet growing interest among educators in gaining skills about Virtual education. This indicates a need to enhance the appeal and accessibility of such courses to better meet the evolving demands of digital education in India.

Although the general trend of enrolment shows that the learners inclined towards lower duration of the course, there are two courses which have comparatively high enrolment in contrasting the trend. The *courses "ICT Skills in Education"* (N= 2190, 6.66%) with 12 weeks duration and *"BESE-141- ICT in Education"* (N= 2105, 6.40%) with 16 weeks duration have defined the trend. Both these courses are at the Under graduate level, which indicates that pre-service teachers are likely to enroll in the courses.

Comparison of Pedagogical Knowledge and Technical Skills Courses

Comparing the number of courses offered on the categories, it can be noted that the number of technical skills is more than Pedagogical Knowledge. The Technical Skills courses (N=15) are 50% higher than Pedagogical Knowledge (N=10).
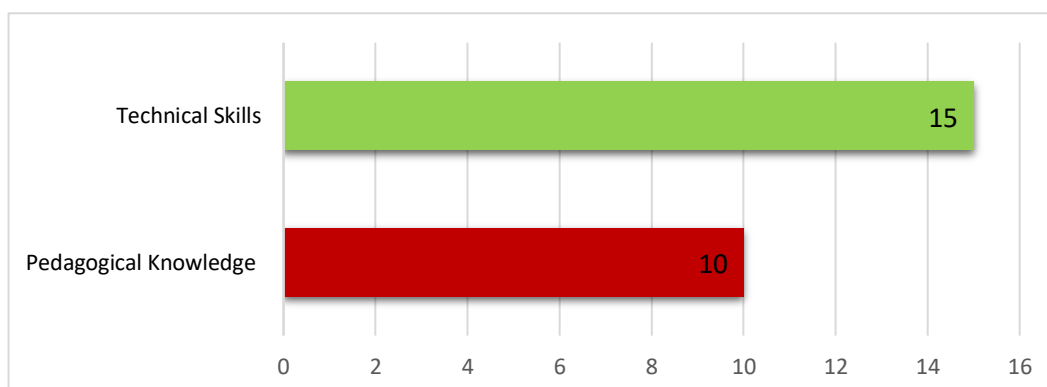

Figure 7: Comparing the number of courses

Comparing the learners enrolled, it can be noted that Technical skill courses (N=32863) have 85% higher enrolments as compared to Pedagogical Knowledge courses, (N=17676) which is a 1: 0.54 ratio. This shows the preference of the learners to Technical Skills over Pedagogical knowledge courses.
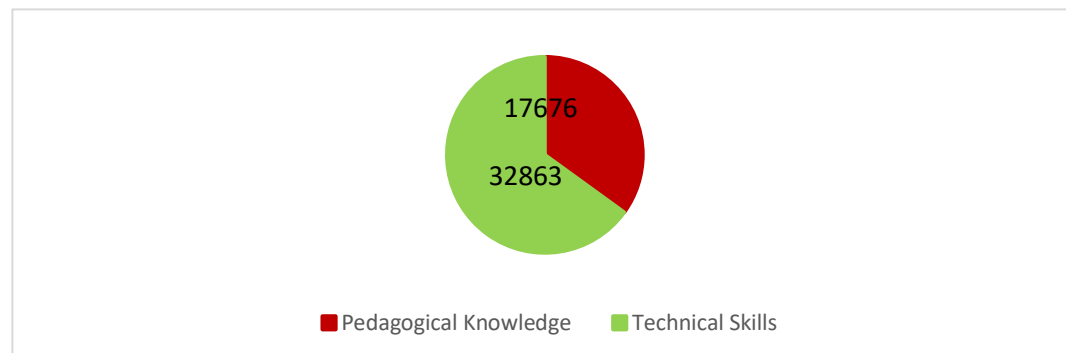

Figure 8: Comparing Learner enrollment

Courses on Innovative Teaching Approaches

To identify the courses that have content aiming at educating teachers on Innovative Teaching Approaches, a detailed analysis of Pedagogical courses was undertaken. It was found that out of the 10 courses, 2 courses a) *"Innovation in Laboratory Instruction - Infrastructure Material Laboratory"* and b) *"Designing learner-centric e-learning in STEM disciplines"* were specific for instruction of STEM subjects, 3 courses were on Instructional Design a) *"MDE-412: Instructional Design",* b) *"Basic Instructional Methods"* and c) *"Advanced Instructional Methods"* and only 1 course has the elements of Innovative teaching Approaches which is *"Design Thinking for Educators"* with only 900 learners enrolled amounting to only 2.7% of the total learners enrolled. An in-dept analysis of content for 3 courses on Instructional Design was further conducted, it was found that *"MDE-412: Instructional Design"* course of 16 weeks and 6 credit units was designed by IGNOU mostly to educate the learners about different educational theories and approaches for training and e-learning.

The course titled *"Basic Instructional Methods"* of 4 weeks and 2 credits designed by NITTTR, provided with exposure to various instructional methods including Teacher-Centred Methods of Lecture Method, Demonstration Method, Question-answer technique, Improved Lecture Method. This course also mentions about Methods for developing Practical Outcomes, Laboratory Work, Workshop Method, Industry/Field Visit, Project Work. It also introduced Student Centred Interactive methods, Tutorial Method, Seminar Method, Assignment Method. This course has an enrolment of 4257 learners amounting to 24.08% of the learners enrolled.

Only one course was identified which has introduced learners to teaching approaches that have the elements of non-traditional teaching is the course titled *"Advanced Instructional Methods"*. With a duration of 4 weeks and 2 credits, this course has 3125, 9.5% learners enrolled. The contents of this course include concepts of Individualized learning, Small group learning, Self-learning, Brainstorming and Nominal Group Technique, Force field analysis, Mind mapping, Delphi and six thinking Hats, Buzz group and In-basket, Focus group discussion, Problem Based Learning, Panel discussion, Group Discussion, Case Study, Role Play and also includes integration of ICT based teaching. The course of *"Design Thinking for Educators"* with duration of 8 weeks and only 900, 2.7% learners enrolled, is another course which caters to the needs of those teachers who aim at developing Innovative approaches and tools for interactive learning experiences that enhance creativity, critical thinking, and problem-solving skills.

LIMITATIONS OF THE STUDY

Like any other research, this study is also limited. There are several courses available on SWAYAM, however this study is restricted to analysing courses offered only under the Teacher Education category and Courses which have English as the medium of Instruction. The scope of this study covers all National Coordinators

offering courses for Teacher Education and ongoing courses which have closed enrolments. The study is limited to analysing only the course outline and contents which are available for public viewing without in-depth analysis of the detailed contents from the enrolled participant view, which limits the search area to more general terms. The study also limits to Pedagogical and Technology skills without considering the Content knowledge, which is also required for the teachers to update themselves with as on-going professional development.

CONCLUSIONS

The courses available in SWAYAM for teachers, primarily reflect a strong emphasis on technical skills, with relatively less attention given to pedagogical knowledge courses. While technical courses aimed at improving teachers' technical competencies are comparatively higher and attract significant enrolments, pedagogical courses remain fewer, signaling a gap in the focus on developing teaching methodologies.

A. Pedagogical Knowledge Courses: Pedagogical courses, though present, are not as extensively developed or diverse as their technical counterparts. Courses like "Basic Instructional Methods" and "Instructional Design" focus primarily on traditional teaching strategies, with a notable inclusion of student-centered approaches. However, the range of pedagogical content appears somewhat limited, with fewer courses targeting innovative teaching methods that could align with current educational trends such as learner-centric approaches, problem-based learning, and critical thinking. While there are some advanced pedagogical courses like "Advanced Instructional Methods", which address curriculum design and e-learning, these appear to be offered at higher levels and seem to cater to a niche audience. The relatively low enrolment in courses like "Design Thinking for Educators" further underscores that educators may be less inclined to pursue specialized, innovative pedagogical training compared to more accessible and widely applicable technical courses.

B. Technical Skills Courses: On the other hand, technical courses on the platform are vast and varied, covering areas such as *Internet of Things", "3D Printing for Educators", and "ICT in Education"*. These courses receive high enrolments, reflecting the growing demand for educators to enhance their technical skills and integrate digital tools into their teaching practices. However, this heavy focus on technology risks overshadowing the need for teachers to develop their pedagogical expertise, which remains foundational to effective teaching and learning. Both pedagogical and technical courses are integral to teacher development. However, a balance between the two domains, with a greater focus on innovative teaching methods and technology integration, could further strengthen the effectiveness of the teacher education courses offered on the platform. To address the imbalance between pedagogical knowledge and technical skill courses, it is recommended that SWAYAM expand its offerings in innovative pedagogical training. Further research can be conducted on the effectiveness of these courses on teaching practices and a comparative analysis on school teachers and higher education teachers. Qualitative analysis of the course impact on school teachers can be conducted.

C. Prominent gaps: A prominent gap identified in the course of analysis is that there are no courses offered for teachers to gain knowledge and skill of integrating Innovative teaching Approaches such as Case studies, Flipped Classroom, Gamification, Project-based Learning, Inquiry-Based Learning, Blended Learning and Experiential learning as found in literature. Among the Technical skills course, there was no course offered on Integration of Artificial Intelligence in Education (AIED) for teachers at a time when the AI revolution is on the rise. Research on the perception of teachers in readiness to integrate AIED would provide for insights into the current status and need for courses on AIED for teachers of all levels.

D. Strengths: Massive Open Online Courses (MOOCs), such as those available on SWAYAM's E-Learning platform, provide India's teachers with scalable, flexible, and inexpensive opportunities to improve their pedagogical knowledge and technical skills. They bridge the accessibility gap for teacher education and continued professional development between rural and urban populations by offering access to high-quality information from prominent educators and organizations in the country. MOOCs enable educators to use innovative instruction approaches, incorporate technology into classrooms, and keep up with current educational trends. MOOCs, with their array of course offerings, cater to a wide range of learning needs and promote continuous development, which is further encouraged by government programs such as SWAYAM.

Overall, MOOCs serve as a revolutionary tool for teacher professional development in India. They enhance the quality of teacher education through continuous, self-paced learning.

E. Weaknesses: Despite their potential, MOOCs on SWAYAM struggle with several challenges and barriers in effectively developing pedagogical and technical skills of teachers in India. Many teachers struggle with self-paced learning due to lack of motivation or time. The absence of personalized guidance and hands-on practice reduces the effectiveness of skill development. Language barriers with mostly the content delivered in English language can also affect the desired outcomes and engagement from the teachers leading it to only click-next -complete pattern. Furthermore, low enrolment and low course completion rates reduce their impact. Without proper support and follow-up, MOOCs risk becoming passive learning tools rather than transformative educational solutions.

RECOMMENDATIONS

To maximize the effectiveness of MOOCs in SWAYAM for teacher education in India, several improvements are recommended:

Encourage Innovative Teaching Approaches:

Need to promote courses on innovative teaching approaches, perhaps by highlighting courses in innovative teaching approaches such flipped classroom, blended learning, gamification, Problem based learning, critical thinking and reflective teaching, which are vital to adapt to modern educational demands.

Teaching with AI: It is evident that AI technology is becoming increasingly important in education, yet there is a clear gap in training teachers to effectively integrate it into their teaching practices. Therefore, it is recommended that practice based, specialized courses on Teaching with AI be developed to bridge this gap.

Hands-on practice in courses: With technical skill courses on the rise, it is essential to provide hands-on practice on tools, software and applications that can be used by teachers. Courses can be offered that provide for video-based practice sessions for teachers to equip for implementation of the technology learnt. Blended learning models combining online and face-to-face support can enhance engagement and practical understanding.

Regional language: Courses should be offered in regional languages with contextual content that addresses India's diverse educational landscape.

After course follow-up: Regular feedback, assessment, certification and follow-up after the course completion can improve credibility and impact. Mentorship programs and peer-learning communities can provide guidance and motivation.

Lastly, continuous monitoring and updates of course content will ensure relevance to evolving pedagogical practices and technological advancements in education.

DECLARATIONS

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