

Effectual Use and Implementation of Micro-Lesson Plan Activities Through Mapping of Bloom's Taxonomy and ICT Technologies

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Abstract : This article depicts the effective way of using various ICT (Information and Communications Technology) tools by innovatively mapping three-staged micro-lesson plan activities to the different cognitive levels of the Bloom taxonomy. In recent times, educational institutions have shifted their focus towards making use of different ICT tools in their teaching and learning processes. Under these circumstances, academicians are moving from the implementation of traditional lesson plans to micro-lesson plans. The effectiveness of micro lessons mainly relies on developing pre-class, in-class, and post-class activities in conjunction with relevant ICT tools. Even after selecting appropriate ICT tools for micro-lesson plan activities, it still becomes a challenging task to match existing ICT tools with students' cognitive levels. The novelty of this article lies in explaining the different ways of mapping class activities with Bloom taxonomy levels and ICT tools. The proposed mapping is applicable to present and

future academic teaching and learning needs. This article also acts as a guide for academicians' effective teaching and learning in any discipline. In addition, our article mentions the prerequisites for mapping and implementing the aforesaid traits. Finally, the effectiveness of our approach has been proven by examining the end exam results as well as by conducting feedback analysis received from stakeholders involved.

Keywords : Blooms taxonomy; Class Activities; ICT tools; Micro lesson; Pedagogy; Teaching and learning

1. Introduction

In recent years, the way of teaching pedagogy has changed rapidly from conventional chalk and board to the use of advanced ICT tools and micro-teaching. Micro-teaching helps teachers instruct their students by scaling down the long-established lesson plan format called micro lesson plans. (Fernandez L Maria,2010, p. 351). Here, scaling down means planning the everyday lecture topic into three different activities, mainly pre-class, in-class, and post-class activities. Pre-class activities are the tasks that have to be completed by students before coming to class.

The main objective of pre-class activities is to provide some prerequisite knowledge required to complete in-class activities. In-class activities

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represent the collaborative activities between teacher and students during instruction hours. The main objective of in-class activities is to examine and focus more on improving students' cognitive skills instead of simply having regular lectures. Post-class activities are the tasks that have to be completed by students after the class. The main objective of post-class activities is to assess the student knowledge gained from pre-class and in-class activities and to take precautions for the next class. Hence, a micro-lesson plan ameliorates teacher and student collaboration inside the classroom as well as outside the class (Marzano, 2007, p.01).

Bloom's taxonomy acts as a teacher's source of strength to realize an effective way of achieving classroom objectives. Bloom's taxonomy was enrooted in 1956 by Benjamin Bloom. Bloom's taxonomy explains different cognitive levels in teaching, learning, and evaluation. To attain fruitful results, craft the micro-lesson plan in alignment with Bloom's taxonomy levels: remembering, understanding, applying, analyzing, evaluating, and creating (J. Barrie, 2020, p.104). As the micro-lesson plan is devised into pre-class, in-class, and post-class activities, one should be able to decide and plan the activities that support different cognitive levels of students. Many academicians are facing a crippling situation and perceive it as a difficult task to find appropriate tools to map Bloom's taxonomy. This article will be a helping hand and act as a blueprint to map activities to different cognitive levels.

To frame the activities of a micro-lesson plan at different cognitive levels, we need pertinent ICT (Information and Communication Technologies) tools. A few years ago, complicated pandemic situations led all the teaching fraternities to change their teaching style from traditional classroom teaching to proactive teaching in combination with digital tools (Evangelia Krassadaki, 2022, p. 03). There are different digital tools available. For example, a variety of audio-visual aids, e-books, MOOCs, online video platforms, podcasts, virtual labs, polls, collaborative annotations, learning management systems, gamification tools, online journals and articles, an online whiteboard, online video conference software, smart boards, etc. All these ICT tools aid teachers in their effective teaching and learning processes. These tools, combined with an effective Bloom's

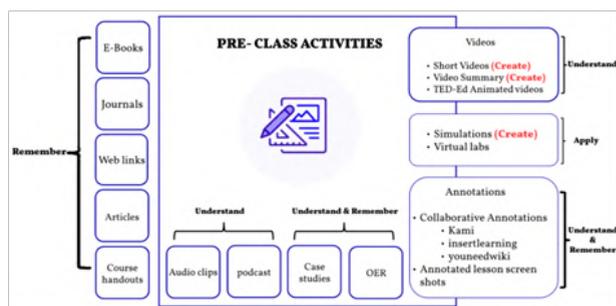


Fig.1: Pre-class activities mapped to Bloom's taxonomy

taxonomy-based micro lesson, lead us to new heights in our education system (Tufail, 2016, p. 203).

The remaining sections of the article are structured as follows: Section II discusses the relevant literature pertaining to our work. Section III outlines the methodology that was employed. Sections IV, V, and VI are dedicated to discussing various types of lesson plan activities. Section VII elaborates on the auxiliary arrangements necessary for micro-lesson plan activities. Section VIII provides an explanation of the experimental case study, along with an analysis of the received feedback. Section X highlights potential research directions. Lastly, the conclusion is presented in Section XI.

2. Literature Review

In this section, we will present a selection of recent studies that are relevant to our work.

(Peter Illic, 2022, p.01) has devised the concept of emergency remote teaching using a micro-lesson plan. The micro-lesson plan has been utilized to deliver English literature during emergency situations such as COVID-19. In this context, the author highlights the importance of the micro-lesson plan but does not establish a direct relationship between Bloom's Taxonomy and the significance of ICT tool usage in the micro-lesson plan.

In their work, (Sasithorn Chyear, 2019, p.215) utilized a blended methodology, combining traditional approaches with micro-teaching techniques to improve teaching practices. However, the authors did not consider the influence of students' cognitive levels, which significantly impacts the effectiveness of teaching practices.

(Ahmed Hosny, 2020, p. 349) proposed a micro-designed approach for incorporating gamification

into assignments. They conducted a micro-level analysis of various tools suitable for gamifying assignments. However, it is important to note that their approach does not consider the perspective of Bloom's Taxonomy.

(Jirarat, 2023,p.206) conducted a study to examine the impact of a flipped classroom approach on enhancing teaching quality and improving learning efficiency among students. The study utilized various research instruments, including questionnaires and interviews, to evaluate the effectiveness of the flipped classroom approach and gather student perspectives. While the findings highlighted the importance of the flipped classroom approach, the study did not provide specific guidance on implementing the flipped classroom in alignment with lesson plans.

In (Hasmawati, 2022, p.22) work, the authors present a method that is helpful for teachers to develop high-quality questions and align them with different cognitive levels using Bloom's taxonomy. However, their method does not suggest an approach for effectively incorporating the same Bloom's Taxonomy into lesson plan preparation.

In their study (Bin Wang, 2018, p.200), the authors designed a website to implement a MOOC-based flipped classroom model with the aim of enhancing students' learning interest and ability. However, their website did not effectively incorporate all the necessary ICT tools, as observed in our case study.

After conducting an examination of the aforementioned research works, it has been demonstrated that our concept of planning micro-lesson plan activities through the integration of Bloom's taxonomy and ICT technologies serves as an effective guide to enhance efficiency in teaching and learning.

3. Methodology

In our research, we have used systematic and structured methodology to carry out the study and to gather data. As a first phase, data collection was initiated by gathering the necessary information and files from all the faculty members of the institution. This data consists of course handouts, virtual lab links, Learning Management System (LMS) links, lab manuals, and video tutorial links, among others.

The data collected from the first phase has now

been uploaded to the Learning Management System (LMS) specifically designed for our institution.

Following the upload, all students have been notified about the availability of new content on the website. Now all the faculty members of the institution have been instructed to prepare micro-lessons aligned with both ICT tools and Bloom's Taxonomy. The micro-lesson plan is now being implemented rigorously, taking into consideration both Bloom's taxonomy and the cognitive levels of the students.

The department coordinators maintain continuous monitoring of the implementation of the microlesson plan and the utilization of ICT tools. The effectiveness of this implementation is evaluated through the analysis of midterm examination marks and the collection of feedback from students, faculty members, and other stakeholders involved in the process.

To gather feedback from various stakeholders, a separate form has been attached to each page of the LMS website. This form includes a questionnaire covering topics such as the accessibility of the platform, the quality of instructional materials, the usage of the LMS in teaching and learning, and the availability of virtual labs.

4. Pre-class Activities

Pre-class activities are activities performed outside the class and before in-class activities. These activities are related to the in-class activities. Activities we are planning in the pre-class phase should be aligned with the objectives of the in-class phase. Most of the activities that we plan in this phase fall under the category of understanding and remembering cognitive levels in Bloom's taxonomy. If the planned concept of the day is easy or moderate, we can assign pre-class student activities at the cognitive level of understanding and remembering, like reading a chapter from an e-book, collecting information from the given web link, reading the given course handouts, listening to audio clips and specific podcasts, reading journals, watching short videos, using predefined collaborative annotations, etc.

If the planned concept of the day involves a complicated theory or problem, we can assign pre-class student activities at the cognitive level of applying or creating, like asking students to create

short videos on the concept or write a video summary, complete prescribed short experiments in virtual labs, etc. Most of the ICT resources and tools that are required for the above activities are already available in the form of open educational resources (Abid Haleem, 2022, p.278). The mapping of the Blooms taxonomy to different pre-class activities is given in Figure 1 .In general, pre-class activities are time-bound. Therefore, the amount of time required to complete pre-class activities should be taken into consideration, and it should be proportional to the cognitive levels of the given concept.

5. In-class Activities

In-class activities are activities performed inside the class and before post-class activities. These activities are often carried out with proactive and collaborative interaction between teacher and students. Most of the planned activities in this phase fall under the cognitive level of Bloom's taxonomy. In-class activities are extremely time-bound and must be planned very carefully. Therefore, time utilization plays the most important role in the success of in-class activities. Activities we are planning in the in-class phase should align with the outcomes of the pre-class phase and the objectives of the post-class phase. Figure 2 depicts different in-class activities that are planned in three phases (Ali Abdulhussein, 2010, p. 1986). These three phases involve the use of ICT tools as well as other formal activities.

A. Phase 1: Post-analysis of Pre-Class Activities

Before starting the lecture and initiating in-class activities, teachers should be able to analyze the level of knowledge already obtained as a result of pre-class activities. To get this basic information, we can make use of online in-class polls, ask questionnaires, and get nonverbal feedback from the students.

B. Phase 2: Performing in-class activities:

Based on the analysis of phase 1, we can dynamically change the cognitive levels of in-class activities.

1) Remember and understand

If the phase-1 analysis has a low score, we can perform activities to either remember or understand cognitive levels. For example, use short videos, present mind maps, project interactive presentations

using the Prezi tool, display annotations, etc.

2) Applying and analyzing

If the phase 1 analysis has a good score, we can perform the activities of either applying or analyzing cognitive levels. For example, allocating more time for problem-solving, providing solutions to real-time case studies, solving puzzles, participating in Think-Pair-Share activities, conducting dynamic polls, and solving the given problem in group discussions.

C. Phase 3: In-class activities end survey

At the end of in-class activities, teachers should take a slice of time to evaluate the student's level of understanding. To perform this survey, we can use

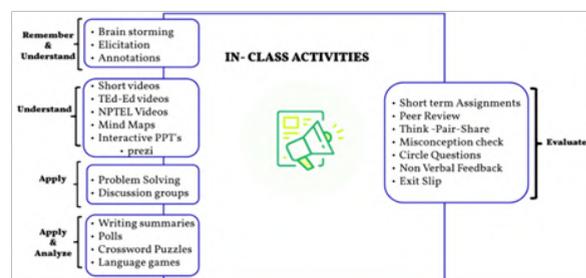


Fig. 2: In-class activities mapped to Bloom's taxonomy

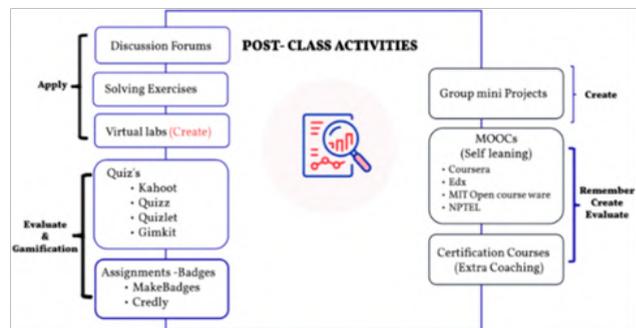


Fig. 3: Post-class activities mapped to Bloom's taxonomy

different activities like misconception checking, non-verbal feedback, the exit slip method, short-term in-class assignments, peer review, etc.

6. Post-class Activities

Post-class activities are activities performed outside the class and after in-class activities. The majority of the activities planned for this phase fall into the categories of applying, creating, and evaluating Bloom's taxonomy's cognitive levels. Activities we are planning in the pre-class phase should be aligned with the outcomes of the in-class

phase. Figure 3 depicts the mapping of different ICT methods and tools for bloom taxonomy.

A. Apply

If we want post-class activities to fall under "apply," we can make students participate in online challenges and solve a few exercise problems that pertain to in-class activities. This can be done with or without the help of virtual labs, and you should encourage them to participate and exchange ideas through active discussion groups.

B. Evaluation

If we want post-class activities to fall under evaluation, we can make students take gamification-enabled online quizzes, badge-enabled online assignments, and proctored exams.

C. Create

If we want post-class activities to fall under "create," we can make students participate in group mini-projects and create new models with the help of virtual labs. MOOC courses also help to create their models. To improve student self-learning capability, suggest students complete a daily module of a registered MOOC course. To fill the gap present in the curriculum, we can provide on-campus extra coaching as a post-class activity.

7. Prerequisites

To get better results, there are a certain number of



Fig. 4. Prerequisites to attain objectives

prerequisites that support all the aforementioned micro-lesson plan activities. These prerequisites are not just for support; they also act as a foundation to attain the objectives of this article. These prerequisites are depicted in Figure 4.

A) Digital teacher training

Teacher training on ICT tools is an important aspect of conducting all activities of teaching and learning on the micro-lesson plan. Therefore, educational institutions need to provide this prerequisite training and financial assistance.

B) Using learning management systems

These are web applications based on online learning and content management platforms that help us to disseminate course handouts, open educational resources, create assignments and quizzes, and perform student performance evaluations. For

Table 1 : Sample Micro Lesson Activities Format

Day	Topic	Objectives	Before Class-Videos, e-Books, Case Studies	In-Class-Activities, Quiz etc	Post-Class-Assignment, Discussion Forum
1	Chapter-I Introduction to UNIX-Brief History	To understand origin, application, basic commands of UNIX operating system	<ul style="list-style-type: none"> Refer the Text book -2 Chapter-1.1 page-2 Refer the video https://www.youtube.com/watch?v=9pfZ1Ncd0vM 	<ul style="list-style-type: none"> Lecture on History of UNIX and its applications Misconception check Non Verbal Feedback 	<ul style="list-style-type: none"> Short Quiz 1_1(Moodle) Discussion in Forum
2	What is UNIX		<ul style="list-style-type: none"> Refer the Text book -2 Chapter-1.2 page-5 Refer the video of Virtual labs https://youtu.be/CP0IKqnRsMk 	<ul style="list-style-type: none"> Lecture on History of UNIX and its salient features Introduction to Virtual labs Registration to CISCO Academy Linux Essentials course Misconception check 	<ul style="list-style-type: none"> Creating accounts in virtual labs and practicing the environment, LE Module 1.1,1.2
3	UNIX Components		<ul style="list-style-type: none"> Refer the Text book -2 Chapter-1.3 page-6 Refer the video of Virtual labs https://youtu.be/2hXdAufc7o 	<ul style="list-style-type: none"> Lecture on Different components of UNIX Think-Pare share Non Verbal Feedback 	<ul style="list-style-type: none"> LE Module 1.3,1.4,1.5 practicing the environment of Virtual labs

example, Google Classroom, Canvas, Microsoft Teams, MOODLE, etc. (Diana Kozlova, 2021, p.2314).

C) Digital equipment and software

Digital equipment helps teachers become content creators. For example, digital writing pads, cameras, microphones, etc. Digital software helps make teachers proactive in creating and editing their content. These days, there is a lot of open-source software available on the Web to achieve this objective. For example, Open Board is interactive whiteboard software for online teaching. Open Broadcaster is screen recording software, and Open Shot Editor is an open-source video editor.

D) Blogging

Blogging helps teachers keep their students up to date on recent innovations and advancements. It helps teachers to disclose their skills, research, activities, awards, etc.

E) ICT infrastructure

In addition to the ICT tools used in the curriculum, educational institutions should incorporate different ICT facilities into their infrastructure. Some examples include using smart boards, ICT facilities in classrooms and laboratories, and providing fast online connectivity.

8. An Experimental Case Study and Results

This case study is like a stepping stone to bringing awareness among teachers and students about the usage of micro-lesson plans, ICT tools, and learning management systems. In this case study, initially, all teaching staff were instructed to prepare subject-wise micro lessons well before the beginning of the semester. A three-day micro-lesson plan activity sample is depicted in Table I.

As a part of this case study, we have built our own basic learning management system for our college. The main objective of creating this consolidated platform is to make all resources readily available to students without any limitations, similar to an open-source platform. Furthermore, it has been designed to demonstrate that the faculty members and students of our institute are proficient in utilizing ICT tools for teaching and learning purposes.

On this web page, we have provided information about faculty blogs, MOOCs, ICT facilities available in colleges, and ICT tools used in the governance of our college. In addition to these sections, there is a separate section for "Teaching and Learning." On a particular department's teaching and learning page, we have provided links for different virtual labs, course handouts, lab manuals, faculty-created online videos, and information about certification courses provided by the department. Figure 6 illustrates an example of a webpage we have built for our department.

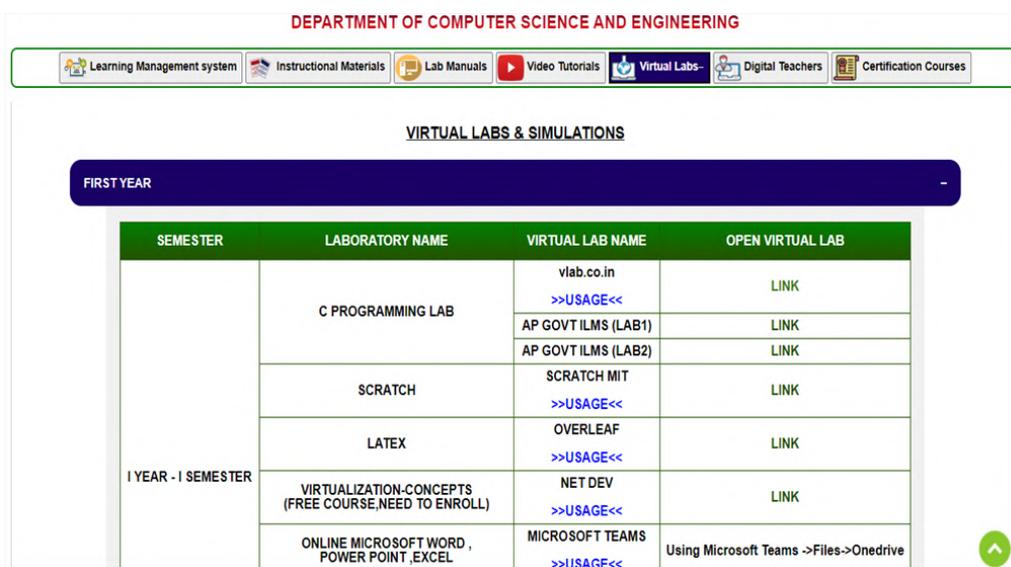


Fig. 6. User interface of LMS implemented

Here, we present the feedback analysis we have collected from students and faculty members over the past two years. This feedback consists of various questionnaires that assess four main metrics, namely: "Accessibility of the platform," "Quality of instructional materials," "Usage of LMS in teaching and learning," and "Availability of virtual labs". Table II and in Figure 7 represented the statistics of the data collected during the academic year 2020-21.

Table 2 : 2020-21 Academic Year Data

Metric	Total Responses	Very Good	Good	Need to improve	Poor
Accessibility	121	31	33	42	15
Quality of Instructional materials	121	47	41	10	23
Usage of LMS	121	55	35	8	23
Virtual labs availability	121	41	43	8	29

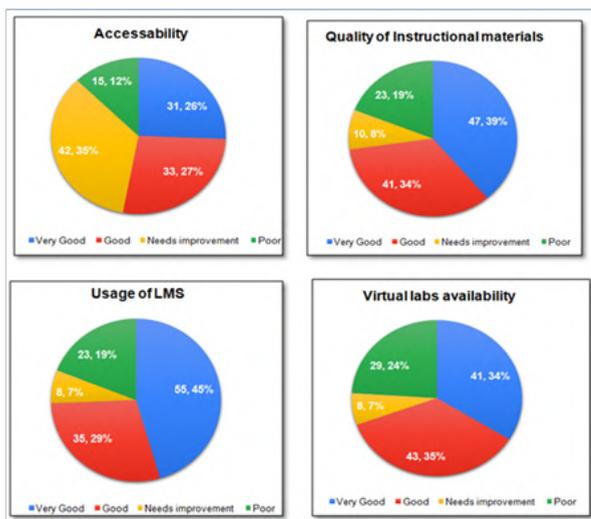


Fig. 7. Pie chart of 2020-21 data

Table II and Figure 8 represent the statistics of the data collected during the academic year 2021-22.

The statistics and figures from the feedback analysis clearly indicate a notable improvement in the utilization of ICT tools for teaching and learning

Table 3 : 2021-22 Academic Year Data

Metric	Total Responses	Very Good	Good	Need to improve	Poor
Accessibility	180	72	56	12	40
Quality of Instructional materials	180	72	51	19	38
Usage of LMS	180	86	42	24	28
Virtual labs availability	180	65	53	19	43

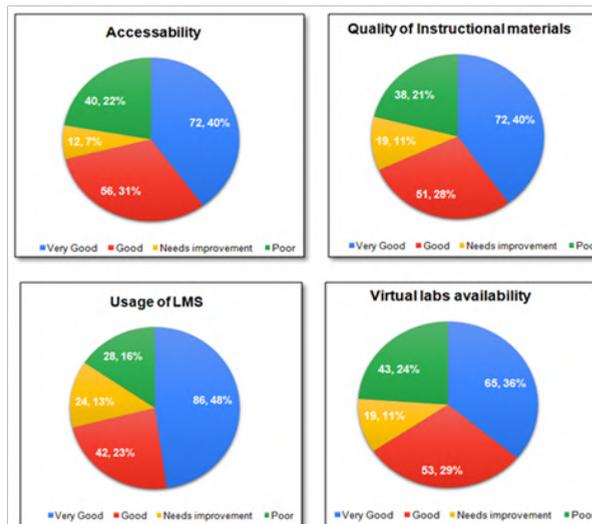


Fig. 8: Pie charts of 2021-22 data

between the academic years 2020-21 and 2021-22. Additionally, the pass percentage in the end- of-semester exams has increased from 87.3% to 91.5% in our institution. These positive outcomes can be attributed to the well-defined mapping of Bloom's taxonomy, the implementation of micro lesson plans, and the effective utilization of ICT tools.

10. Future Research Directions

As a future research direction, we would like to conduct longitudinal studies to examine the long-term impact of micro-lesson plans and the use of ICT tools. Further research could focus on an effective validation mechanism to validate the effectiveness of mapping micro-lesson plan activities to different cognitive levels of Bloom's taxonomy.

11. Conclusion

The effective use of ICT tools and their incorporation into well-planned micro-lessons, based on Bloom's taxonomy, enhances teaching and learning outcomes. This article addresses the research question of how to implement activities before, during, and after class by aligning them with Bloom's taxonomy levels, different teaching methods, and ICT tools to improve the teaching and learning process. The experimental case study, conducted using our method, along with feedback analysis and results, demonstrates the effectiveness of our approach. The article also emphasizes the necessary prerequisites for achieving our objectives. Moreover, our contribution provides valuable insights and guidance for future teaching and learning needs.

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