2082

One Month Certification Training Curriculum

Mathematics

Secondary Level Grade 11 and 12

Government of Nepal

Ministry of Education, Science and Technology

Centre for Education and Human Resource Development

Sanothimi, Bhaktapur

Table of Contents

1. Introduction

Learners must be taught about the innovations brought by globalization with the use of the latest teaching-learning tools, techniques, and methodologies. It is essential to provide different types of training to the teachers for their professional development to implement the curriculum effectively. Therefore, the certification training course has been prepared based on the Teacher Competency Framework 2072, Teacher Professional Development Framework (Revised Version) 2080, and Secondary Education Curriculum Class (11-12) 2077 (Mathematics). The Secondary Education Curriculum Class (11-12) 2077 (Mathematics) emphasizes that students should construct knowledge themselves, rather than transferring mathematical knowledge. According to the essence of the curriculum the teacher needs a teaching strategy and skills to produce students who can build understanding by searching for themselves. Therefore, after the successful implementation of this training curriculum, it is expected that the professional development of teachers teaching mathematics in the 11th and 12th grades will improve the learning level of students in mathematics.

The implementation of this training curriculum is expected to develop mathematical knowledge, skills, efficiency, a positive attitude and thinking, and interest in mathematics among students. This curriculum includes the study of the mathematics curriculum methods, materials, and techniques used in the teaching of mathematics, mathematical contents, classroom management, methods of teacher professional development, lesson study and practice, functional research, and student assessment.

The contents covered including teachers' needs in this training curriculum will be conducted through face-to-face and virtual or blended workshops and school-based/project-based approaches.

Based on the needs of the teacher, the topics covered in this training curriculum will be conducted through face-to-face and virtual or blended workshops and school-based activities/projects based on active learning methods and approaches.

2. Competencies

After completion of the training, the teachers will develop the following competencies:

- Use curriculum, textbooks, and other resources as per the needs and demands of society.
- Apply mathematical concepts related to everyday life in their instructional practices.
- Use of appropriate teaching methods, teaching material, and information and communication technology.
- Develop test items aligning with the format prescribed by the Curriculum Development Centre.
- Develop different tools for assessing students' progress including rubrics.
- Imply different tools of student evaluation (internal and external) in learning and result analysis.
- Imply appropriate approaches to teacher's professional development as per his/her needs.
- Use Innovative Pedagogy (action research, lesson study, etc.) and share the implications of their innovations to enhance professional development and students' learning achievement.

- Apply proactive-reactive, rule-compliance-integrity approaches in managing the classroom for the learning environment.

3. Training Structure

This certification training program is a one-month (30 working days) course divided into two sections:

a. 15 Days of Facilitator-Led Training: This section can be delivered face-to-face at the training centre, online, or in blended mode using synchronous and asynchronous methods.

b. 15 Days of School-Based Activities: following the initial 15 days of training, participants will complete a series of school-based activities to solidify their learning. These activities will allow participants to apply the knowledge and skills acquired during the first section in their respective school settings.
   - Participants must complete the following activities in their schools within 60 days of completing the first training section. These activities will fulfill the training program requirements.
   - A detailed report documenting the school-based activities must be prepared and presented at the training centre within the stipulated timeframe.

School-based Activities

S.N.	Activities	Weightage (working days)
1.	At least 10 lesson plans and practice teaching	3
2.	Teaching Improvement Plan (TIP)	2
3.	Action Research	2
4.	Lesson Study Practice (Planning, Implementation, Reflection, and Improvement)	2
5.	Use of ICT for innovation in learning	2
6.	Use of Supplementary materials in Mathematics class	2
7.	An additional project without repeating the contents of points up to six, as outlined in the 15-day training curriculum via face-to-face, online, or blended mode	2
Total		**15 days**

4. Training Contents

The contents prescribed for the training are as follows:

SN	Contents	Elaboration of Contents	Sessions
1	Introduction of the Training Program	• Introduction to the Training Program • Collection of participants' expectation • Identification of their needs	1
2.	Study of the Curriculum, textbook, and Resource Materials	• Study of Mathematics Curriculum and Textbooks • Comparative study of Mathematics curricula • Resource materials	1
3.	Instructional Strategies	• Inductive and deductive method • Inquiry-Based Learning (IBL) • Problem-Solving Approach • Collaborative and Cooperative Learning Approach • Flipped Classroom Approach • Game-Based Learning • Problem-Based Learning (PBL) • Project-Based Learning • Discovery Learning Approach • Differentiated Instruction • Ethnomathematics Pedagogy	4 (2 theory + 2 Integrated with TPACK)
4	Instructional Materials	• Selection and Collection of Instructional materials/virtual materials/developing digital content • Construction and Use of Teaching Materials in Mathematics Classroom • Technology integration in teaching and learning Mathematics • Graphing Software	3 (1 introduction + 2 Integrated with TPACK)
5.	Fundamentals of Mathematics	• Mathematical Language, and Syntax • Mathematical writing using the language of logic, operators,	2

		signifiers, qualifiers, and connecting ideas.	
6	Mathematical Proving Techniques and Proofs	Different methods and techniques of proof: • Direct Proof • Indirect Proof (Method of contradiction) • Contrapositive Method • Counter Example • Mathematical Induction	2 (1 theory + 1 Integrated with TPACK)
7	Domain of Technological Pedagogical and Content Knowledge (TPACK)		
	Algebra	• Logic and set • Real numbers • Function • Curve Sketching • Sequence and Series • Matrices and determinants • Complex number • Permutation and Combination • Binomial theorem	4
	Trigonometry	• Inverse circular functions • Trigonometric equations and general values • Properties of a triangle	1
	Analytic Geometry	• Straight line • Pair of straight lines • Coordinates in space • Conic section	2
	Vectors	• Product of vectors	1
	Statistics and Probability	• Correlation and Regression • Probability	1
	Calculus	• Limit and continuity • Derivatives and Anti-derivatives • Differential equations	3
	Numerical Methods	• Numerical computation • Numerical integration • System of linear equations	2

		• Linear programming	
	Mechanics	• Statics and Dynamics	1
8	Classroom Management	• Physical, Psychological, and Social Diversity and Managing large Class • Facilitation based on Student's learning level	2
9	Students' Evaluation	• Internal Assessment (As provided in the curriculum) • Construction of Test items based on the specification chart and Preparation of the Answers Key • Construction of Rubrics for Student Assessment • Manage and Record Students' Evaluation • Analysis of Test Results and Remedial Teaching • Alternative & Modern Evaluation Strategies	5
10	Action Research	• Meaning and Importance of Action Research • Types of Action Research: Individual Teacher Action Research; Collaborative Action Research; Participatory Action Research. • Identify challenges in teaching mathematics. • Research to explore solutions. • Documentation and sharing of findings.	3
11	Professional Development	• Participating in workshops, seminars, and conferences. • Engaging with professional learning communities. • Writing and publishing papers based on personal experiences and best practices.	3
12	Lesson Study	• Concept and Practice of Lesson Study • Develop Lesson Plan	2

13	Evaluation of Training Sessions and develop an action plan	• Reflection of Participants • Development of an Action Plan for the next session	1
14	Examination and Closing Sessions	• Closing of Training Session • Examination	1

Note: The duration of each session is 1.5 hours. The domain of TPACK can be reformulated based on participants' needs.

5. Training Implementation Procedure

a. The target group of this training is secondary-level Mathematics teachers who teach Grades 11 and 12. Participants will be selected based on the following priority criteria:
   i. Permanent teachers who have not received certification training
   ii. Other teachers who have not previously received certification training
b. Participants will be selected from the local levels. Provincial Education Training Centres will conduct the training. Training needs to be conducted prioritizing school holidays, at the end of the academic year, and at the beginning of the new academic year.
c. The teacher professional development training will be delivered based on the curriculum approved by the Educational Human Resource Council. It will use trainers' guides, trainee resource materials, and other necessary materials developed by CEHRD or Provincial Education Training Centres.
d. Training centres have the flexibility to adapt up to 20% of the approved training to address local needs during delivery.
e. The trainers or roster trainers of Provincial Education Training Centre trainers (including those on the roster) must complete dedicated TOT sessions before facilitating training sessions based on this curriculum. CEHRD will organize these TOT sessions.
f. Optimum use of ICT should be made during training facilitation.
g. All necessary materials for the training should be prepared and available before the training commences.
h. The training sessions should employ the following methods to promote effective learning:
   - Discussion and interaction among the participants
   - Synchronous and asynchronous method
   - Group work, pair work, and individual work as per the nature of tasks/contents
   - Micro-teaching
   - Demonstration of the activities by the facilitator
   - Distance learning
   - Self-study
   - Inquiry method
   - Problem-solving method

- Reflective learning
- Flipped learning model
- Relating to real classroom contexts
- Project-based learning

i. Trainees will be required to consult the provided reference materials, maintain regular contact with facilitators, and prepare a detailed report on their school-based activities. Facilitators will be responsible for guiding trainees through various communication channels, including e-mail, phone calls, or an in-person meeting, depending on what is most convenient.

j. Training certification will be awarded following the revised Teacher Professional Development Framework- 2080. Upon successful completion of both training sections, respective Provincial Education Training Centres will issue training certificates to the trainee teachers,

6. Training Evaluation

a. The total weightage of the evaluation of the teachers participating in the training will be 100 marks.

b. The criteria for evaluation and distribution of marks will be as mentioned in the table below:

S.N.	**Criteria for Evaluation**	**Marks**
First Section: Workshop based on Face-to-face at the training centres or online or in blended mode		
1.	**Participation**	**15 marks**
1.1	Attendance	3
1.2	Active engagement in discussion and presentation	6
1.3	Adherence to the Code of Conduct	3
1.4	Commitment to the training	3
2.	Written Test	30
3.	Formulation of work plan for school-based training activities	5
Total		50 marks
Second Part: School-based training activities		
1	Task Completion	21
2	Report	21
3	Presentation	8
Total		50 marks
Grand total		100

c. Absences from training sessions will incur a deduction of 0.5 marks per missed session. Participants who are absent for three or more sessions will be deemed to have not completed the training program.
d. A written test will be administered at the end of the training. The test specifications are as follows:

S. No.	**Question types**	**Number of questions**	**The weightage of each question**	**Total marks**
1	Multiple Choice	10	0.5	5
2	Short answer questions	5	3	15
3	Long answer questions	2	5	10
Total		**17**	**-**	**30**

e. The trainee participants must complete their assigned tasks in collaboration with and with the full cooperation and support of the school head teacher.
f. The teacher's report on task completion must be verified by the head teacher of their respective school. Similarly, the head teacher's report on task completion must be verified by the chief of the local education unit or a designated expert.

g. The criteria for evaluating school-based training activities will be as follows:

S. no.	Area	Evaluation Criteria	Marks
1	Task Completion	1. At least 10 lesson plans and practice teaching 2. Teaching Improvement Plan (TIP) 3. Action Research Report 4. Lesson Study Practice a. (Planning, Implementation, Reflection, and Improvement) 5. Use of ICT for innovation in learning 6. Use of Supplementary materials in Mathematics class 7. An additional project without repeating the contents of points up to six, as outlined in the 15-day training curriculum via face-to-face, online, or blended mode	$3 \times 7 = 21$
2.	Report writing	Evaluation of Reports a. Format b. Presentation of the contents c. Valid evidence	$3 \times 7 = 21$
3.	Presentation	1. Confidence 2. Presentation skills 3. Logical expression 4. Reflection	8

h. The score obtained by the participants will be graded as per the following criteria:

S.N.	**Division**	**Score range**
1.	First division with distinction	90 % and above
2.	First division	80% - 90%
3.	Second division	65% - 80%
4.	Third division	50% - 65%
5.	Fail or incomplete	Below 50%

i. The trainees must obtain 50/50 marks in both sections of the assessment.

7. Guidelines for School-based Activities

During the school-based training components, participants will be required to undertake various tasks, including classroom activities, research projects, and other related works. These tasks are essential for the successful completion of the training program.

Project work 1: Practice Teaching Based on Lesson Plans

- Develop ten distinct lesson plans aligned with the curriculum and textbook for grades 11-12.
- Design instructional materials for each lesson.
- Obtain approval for the lesson plans from the head teacher.
- Deliver the ten planned lessons and write a reflective analysis for each class.
- Prepare a report that details student learning achievements and include your reflection on the teaching experience.

Note: Lesson plans should be prepared only for topics not covered by other project work.

Project work 2: Formulation of Teaching Improvement Plan (TIP)

As part of the school-based training, trainees must develop and secure the head teacher's approval for Teaching Improvement Plans for each grade level, followed by a concise report.

Format for TIP

Teaching Improvement Plan (TIP)

Teacher's name:……..... School's name…….....

Plan Duration: 2081…..... month to 2081.. …….....……month

S. N.	Indicator	Baseline	Target	Interventions to achieve the target
1	**Students average achievement**			
(a)	Grade …… Subject …….			

S. N.	Indicator	Baseline	Target	Interventions to achieve the target
(b)	Grade …… Subject …….			
2	Based on the self-evaluation, the status of using the instructional materials (Scale from low to high rate 1, 2, 3, 4)			
3	Number of lessons taught with daily activity details preparation			
4	Based on the self-assessment the status of support received from the head teacher for effective teaching evaluation (Scale from low to high rate 1, 2, 3, 4)			
5	Time of completion of monitoring, assistance, and instructional counselling from the trainer, roster trainer, education officer, and head teacher (quarterly)			

……... …… … …… ……

Date Signature School stamp The Head Teacher

Note: You can use any acceptable format for your action research report.

Teaching Improvement Plan (TIP) Progress Report

Teacher's name:……..... School's name…….....

Plan Duration: 208…..... month to 208.. …….....……month

S. N.	Indicator	Baseline	Target	Interventions to achieve the target	**Progress**	Working Experience
1	**Students average achievement**					
(a)	Grade …… Subject …….					
(b)	Grade …… Subject …….					
2	Based on the self-evaluation, the status of using the instructional materials (Scale from low to high rate 1, 2, 3, 4)					
3	Number of lessons taught with daily activity details preparation					
4	Based on the self-assessment the status of support received from the head teacher for effective teaching evaluation (Scale from low to high rate 1, 2, 3, 4)					
5	Time of completion of monitoring, assistance, and instructional counselling from the trainer, roster trainer, education officer, and head teacher (quarterly)					

……... …… … …… ……

Date Signature School stamp The Head Teacher

Project work 3: Action Research/Participatory Action Research

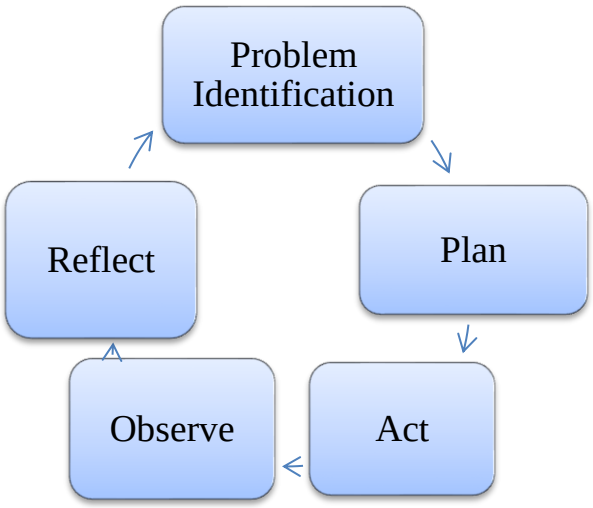
Carry out action research on any topics specified by the curriculum of Grade11 or 12 or on an issue in teaching-learning practice such as student motivation, student participation, and students' irregularity in the class.

Write a reflective action research report mentioning the changes you could bring.

Disseminate the findings to your colleagues and compile their reflections/feedback/observations on the report. You may present your project work in different media e.g., poster, report, PowerPoint.

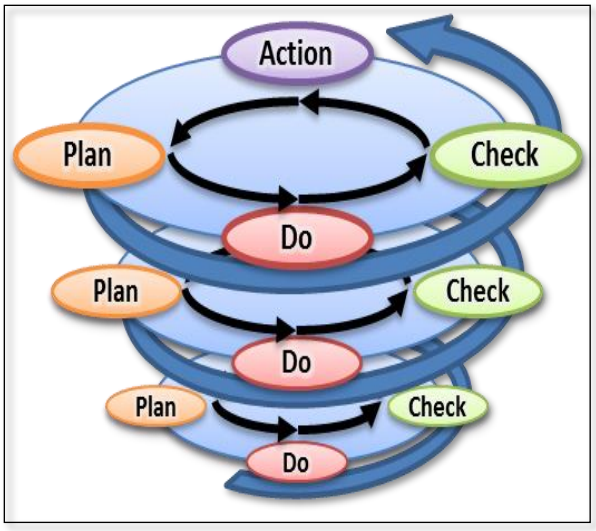
The steps of action research/participatory action research are:

a. Identification of the problem
b. Investigation of the problem (reasons, possible solutions, ways of collecting evidence)
c. Trying out the solution/action/intervention
d. Collecting evidence of whether the solution was successful or not
e. Lesson learned and refection



Project 4: Lesson Study Practice

- Engage in lesson study, a collaborative professional development approach for teachers. This involves:
    - Developing a lesson plan that addresses a specific student's learning difficulty.
    - Implementing the lesson plan in a classroom setting.
    - Observing and discussing the effectiveness of the instructions with colleagues.



Project Work 5: Use of ICT for Innovation in Learning

- Identify and collect web-based resources or digital content suitable for teaching a mathematics lesson. This may include finding, creating, or editing digital materials and identifying relevant software.
- Use the collected or created digital resources during the lesson to facilitate teaching and learning.
- Prepare a report that includes the impact of using these resources on students' learning and your teaching experience.

Project Work 6: Use of Supplementary Materials in Teaching Mathematics

- Identify and gather suitable supplementary materials for teaching a mathematics lesson. (These can include reference materials such as resource books, additional textbooks, articles, research papers, and reports.)
- Use these supplementary materials in the teaching process.
- Prepared the report including names of the supplementary materials, the methods of their utilization, and your teaching experience.

Project Work 7

The trainees can choose any two project works from this section. Alternatively, the trainers can suggest other relevant tasks for the project work. Some suggested projects are given below:

A. Result Analysis

Collect the scores of grade 11 or 12 students of your school in Mathematics in their final examination (include scores of the past three years).

- Draw a frequency distribution table of suitable intervals.
- Construct a frequency polygon and frequency curve from the above distributions.
- Find the trend and generalize the result.
- Calculate the measure of central tendency and measure of dispersion to analyze the data
- Interpret the result
- Prepare the report.

B. **Developing Mathematical Activities**

i. Construct a model of the ellipse by using a piece of pencil, rope, and nails.
ii. Teach the concept of ellipse using the model.
iii. Find the difference between teaching the concept of ellipse using material and without material.
iv. Prepare a report.

C. **Using Online Resources**

i. Write a linear programming problem that is used in our daily life.
ii. Express this mathematically.
iii. Solve the problem using online resources.
iv. Analyse the result.

D. Mathematics Teaching using ICT

i. Randomly choose 10 students from your class.
ii. Measure their height and weight.
iii. Find the correlation coefficient between their height and weight.
iv. Use appropriate ICT tools to find correlations.
v. Analyse the result.
vi. Prepare a report

E. Curriculum Analysis

i. Study the mathematics curriculum for grade 11 and 12 students.
ii. Analyse the curriculum.
iii. Prepare a report.

Note: For project work related to the creation and utilization of materials, the materials themselves must also be submitted along with the report to the Education Training Centre.

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