

Examination Reforms: ICT based On-Demand Examination System

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Abstract

Examinations should not be seen as a burden but as a tool for enhancing learning. Examination system needs to be flexible and transparent in view of paradigm shift in teaching-learning processes.

Over the years the National Institute of Open Schooling (NIOS), India, has been endeavoring to weave certain learner friendly inputs in its examination system. **Multiple sets** of question papers are used for testing the **competencies** indicated in the question paper design and blue print. Continuous assessment through Tutor Marked Assignments is an integral part of learner's evaluation. There is facility of credit accumulation, transfer of credits from other Examination Boards and freedom of choice of subjects. A learner gets nine chances over a period of five years to complete a course. The examinations are conducted twice a year at a fixed schedule where the learning objectives and contents are tested.

Considering the frequency of assessment as the major challenge, NIOS has introduced the noble concept of ICT based On-Demand Examination System (ODES). It provides opportunity of quality assessment of the competencies of the learner. The assessment takes place when the individual learner considers himself/herself ready for examination. Not only ODES is independent of time but it also allows the learners to improve their performance till they are satisfied. A huge database of items containing different forms of questions from the learning objectives (knowledge, understanding, application and skill) has been developed. A unique question paper is generated randomly with the help of specially designed Software package using standardized question bank.

The implementation of ODES in NIOS has facilitated in making the public examination system learner centric and stress-free. It has also established higher level of transparency in the examination system by monitoring the conduct of examination through close circuit camera. The paper elaborates the academic and technical aspects of the On-Demand Examination System that is in operation in NIOS.

1. INTRODUCTION

- 1.1 The present day examination system is characterized by memorization in the baneful effects of the phenomenon. The existing examination system is more or less a test of rote memory with little emphasis on understanding and application.
- 1.2 To minimize the undue emphasis on rote memorisation, there is a need to shift towards competency based testing. Appropriate reforms in the examination system have been emphasised by various committees and commissions appointed by the Government of India during the pre and post-independence period. The National Policy on Education (1986) states;

“ A major goal of examination reform should be to improve the reliability and validity of examinations and to make evaluation a continuous process aimed at helping the student to improve his/her level of achievement rather than certifying the quality of his/her performance at a given point of time.”

However, even today, testing of higher thinking abilities – understanding, application, analysis, synthesis and judgment – is not being focused upon in the measure called for.

- 1.3 The Open Learning system is based on the needs of individual learner. Open learning enables the learner to control what, where, when and how to learn. Here, the focus is on the learner and the learning process. The flexibility in the examination system also helps a learner to pursue learning at his/her own pace of learning. This in fact is a key foundation behind the success of all distance and open learning programmes.
- 1.4 The National Institute of Open Schooling (NIOS), India is the largest Open School in the world in terms of enrolment, courses of study and the geographical areas of its operation. The cumulative enrolment during the last five years is about 1.5 million in Secondary, Senior Secondary and Vocational Education. NIOS has been vested with the authority of enrolling and certifying students up to pre-degree level.

2. NEED FOR REFORM IN THE EXAMINATION SYSTEM

It has been felt for quite some time that the present system of conducting examination only once or twice a year and on fixed dates does not fully meet the criteria of openness and flexibility in learner's evaluation. Taking note of the fact that the frequency of examinations is a major challenge, the NIOS has introduced ICT based On-Demand Examination (ODE) at Secondary (Class 10th) and Senior Secondary (Class 12th) stages of Education. This paper elaborates the academic and technical aspects of the implementation strategies of the On-Demand Examination that is in operation in NIOS. The implementation of ODE is conducive to ensuring quality in assessment of the diverse competencies of the learner and different areas of content in due proportion.

3. GENESIS OF ON DEMAND EXAMINATION (ODE) IN NIOS

The National Institute of Open Schooling (NIOS) conducts two examinations during April and October every year. While trying to enhance flexibility in the timing of summative assessment, NIOS came up with the innovative concept of ICT based On-Demand Examination (ODE), where assessment takes place when the learner considers himself/herself ready to take an examination on one or more subject. Not only is ODE independent of time but it also allows the learners to improve their performance till they are satisfied with the mastery level set by them individually. Thus, **ODE** has extended and enhanced the dimension of openness in the Open Schooling System where examination is self paced and degree of performance is learner controlled. Undoubtedly such a system provides a non-threatening evaluation system vis-a-vis the traditional fixed schedule Public Examination. ODE reduces pre examination stress.

3.1 Concept of ODE

Under ODE, a unique question paper having defined number of items is generated randomly by the computer (on the day of the examination) out of the already developed question bank on the basis of question paper design and the blueprint of the subject. The question paper is unique for each student.

3.2 Significant Characteristics of ODE

- ODE allows the student to take examination when he/she is ready. Readiness depends on the Student and not on the institution.
- ODE permits the student to choose the date of his/her examination.
- ODE reduces the threat of failure in examination.
- ODE removes frustration, loss of self esteem, peer group ridicule, and depression that are generally characterized by the Term-End Examination.
- Since under ODE, information about result is immediate, success even bits is a strong motivating factor.
- Under ODE, the degree and level of performance is decided by the student who can reappear in the examination as many times as s/he wants, till satisfied.
- ODE is also helpful in containing malpractices in examinations, as it is a system where the tools for evaluation are unique for individual student. The question paper for each Student is different having comparable difficulty level.
- ODE respects the *individuality* and *sovereignty* of the student.

4. FRAMEWORK OF ODE

The planning and operational aspects of the On-Demand Examination (ODE) are as follows:

- Development of the Question Bank based on the Designs and Blueprints
- Development of Software Application Programme
- Generation of Question paper and the corresponding Marking Scheme

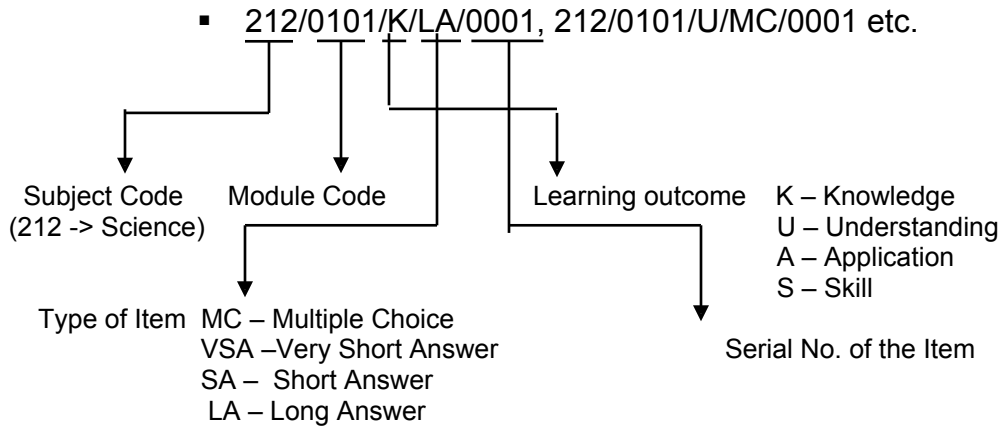
4.1 Development of Question Bank

For the implementation of On-Demand Examination (ODE), a comprehensive Item/Question Bank in each subject has been developed based on the question paper design and the blueprint of the subject. The blueprint of a subject contains many cells. As per the question paper design, the desired cells are activated/marked. The quality of the items/questions in the question bank is crucial in execution of the testing through ODE. The emphasis is on the setting up of individual question/item of good quality. This process facilitates development of quality question bank. The focus of the questions/items is on application rather than mere rote memorization. Moreover, while framing the question/item, the dimension of competency is kept in mind in order to test higher order abilities/proficiencies like reasoning and analysis. The questions/items are categorized according to their form, expected level of difficulty, topic, competency being evaluated and usage and testing record.

35-40 items having comparable difficulty level have been developed for each of the activated/marked cells of the blueprint. The items/questions were prepared involving the subject experts. The database of such items/questions forms an item/question pool. The items/questions from the item/question pool are reviewed, edited, sample tested and finalised. The finalised items/questions based on blueprint cells together constitute the question bank. The Question bank contains various types of questions such as multiple

choice questions, short answer questions, very short answer questions and long answer questions as per the question paper design and blueprint of the subject. The question paper is of equivalent standard with those of the regular examinations of NIOS and of other Boards of School Education.

For identification, each item is given a code indicating the subject, the content area to which the item belongs, the objective being tested, the type of question and the serial number of the item. For example:



The database of the question bank contains the Item Code, Item Description, Marks attributed to the item and the Value points for the Marking Scheme.

4.2 Development of Software Application Programme

A software application programme has been designed and developed by the in-house technical team. ODE Application is a Graphical User Interface (GUI) package, which has been designed in a user-friendly manner where user can do the required activities by selecting different options available in the different pull down menus. All the activities related to ODE have been given in different menus available in the ODE Application Package.

The main function of the ODE Application package is to generate a unique yet comparable Question paper for each learner registered for ODE. While generating such a unique question paper, items are taken randomly from the item bank so that no two sets of question papers are same or repeated.

The compilation of the Marking Scheme is another main function of the ODE Application Package besides maintaining the User Profile, Data Transfer and Data Backup. The marking scheme is compiled for each question paper. The marking scheme is compiled by the system after two days of conduct of the examination to facilitate evaluation of the answer booklet.

4.3 Generation of Question Paper

For each subject question paper, a paper design is prepared. This is a policy statement governing the question paper ensuring balance in various aspects of the question paper. The generation of the question paper is based on the following inputs:

- Question paper design and blueprint.
- Number of items in a question paper.
- Total number of items in the question bank.

Based on the question paper design, a Blueprint is developed. The Blueprint is a three dimensional grid, which allocates the number of questions and marks to each module/unit of the subject, the learning objective and the type of question. Such a Blueprint defines how many items are to be taken from each content unit, for each learning objective and for each type of item. An exemplar Blueprint for the subject Business Studies is as follows.

Sample Blueprint

Subject: Business Studies		Class: Secondary (10th)												
Maximum Marks: 100		Time: 3 hours												
Sl. No.	Objectives Content Unit Forms of Questions	Knowledge				Understanding				Application & Skill				Total
		LA	SA	VSA	MCQ	LA	SA	VSA	MCQ	LA	SA	VSA	MCQ	
1.	Business Environment				1(1)	7(1)		3(1)	1(1)					12(4)
2.	Structure of Business Organisation	7(1)			1(1)		5(1)		1(1)					14(4)
3.	Service Sector and Business		5(1)		1(1)			3(1)	1(1)		5(1)		1(1)	16(6)
4.	Banking and Insurance			3(1)			5(1)	3(1)				3(1)		14(4)
5.	Selling and Distribution			3(1)	1(1)			3(1)	1(1)		5(1)	3(1)		16(6)
6.	Consumer Awareness			3(1)		7(1)		3(1)				3(1)		16(4)
7.	Career Opportunities in Business		5(1)			7(1)								12(2)
	Sub Total	7(1)	10(2)	9(3)	4(4)	21(3)	10(2)	15(5)	4(4)		10(2)	9(3)	1(1)	
	Total	30(10)				50(14)				20(6)				100(30)

Figures within parentheses indicate the No. of items.

4.3.1 Number of Items in a Question Paper

The Blueprint presents the placement of each question of the question paper in a grid. It also assigns the weightage to each Cell and thus fixes the total number of items in a question paper, which is generally between 30 to 35 for a subject. While generating a question paper, the computer randomly picks up a question item from about 35 to 40 questions in each cell of the Blueprint. Each item has a distinct serial number and is classified as per the blueprint. Thus each student appearing in a subject will get different items leading to different question paper. However, since the Blueprint guides generation of the question paper by the computer, the weightage of each question paper set is maintained in terms of content, objectives and the types of questions.

4.3.2 Total Number of Items in the Question Bank

For each subject, a Data Bank of the Questions has been created as per the Design and the Blueprint provided for the purpose. The number of items in the question bank is crucial in determining the number of different question papers that can be generated. The larger the size of the question bank, the higher is the number of different sets of question papers. In the existing question bank, about 1000 to 1200 items have been developed in each subject and computerized to form an item bank for that subject.

The *number of distinct question papers generated* in a subject using the question bank is very large. To have an idea, let us suppose the following inputs in a subject:

1.	Total number of questions in the item bank	=	1000
2.	Total number of questions in a randomly generated question paper	=	32
3.	The number of Modules/Units from which these questions are to be taken	=	07
4.	The number of Objective areas from which these questions are to be taken	=	04
5.	The number of Types of Questions included	=	04

Then as per the formula of permutation and combination, the number of different question papers that can be randomly generated is:

$$\frac{{}^{1000}C_{32}}{\dots\dots\dots}$$

$$= {}^{32}C_7 \times {}^{32}C_4 \times {}^{32}C_4$$

$$= 5.3 \times 10^{44} \text{ (approx.)},$$

If the number of items in each cell increases, the number of different question papers will also increase. However, the chances of repetition of a particular question depend on the number of questions available in that particular cell.

The probability of repetition of a question = 1/number of questions available in that particular cell.

The items/questions in the question bank are reviewed and revised regularly on ongoing basis in order to reduce the probability of repetition depending upon the usage and testing record of the items/questions. Quality questions are also appended in the question bank for enrichment of the question bank.

5. IMPLEMENTATION STRATEGIES FOR ODE IN NIOS

Field Testing: The implementation of ODE has been done after due filed trialing of the question bank. Sample questions were prepared and field testing was conducted among the NIOS learners. The result of the field testing was positive and was equivalent to the public examinations. After having established the feasibility and ground level viability of the ODE, NIOS conducts the On-Demand Examination (ODE) at about 65 Centres Pan-India – 22 at its Regional Centres and 43 at the Kendriya Vidyalayas.

5.1 Conduct of Examination

- At present, a student can appear in Secondary (10th) or Senior Secondary (12th) class subjects through ODE.
- The Question Paper is bilingual (Hindi and English medium). However, the student is free to write the examinations in any of the scheduled languages irrespective of the medium opted for study at the time of admission.
- The generation and printing of Question Paper is done on the day of the examination and is given to the students 10 minutes before the examination.

- **There is arrangement of overseeing invigilation and recording conduct of ODE through close circuit camera (CCTV) installed in the examination hall.**
- At the end of the examination the Question Papers and Answer Booklets are collected. The students are not allowed to leave the examination hall without returning these items.
- Practical examination under ODE is conducted at the Study Centre (Accredited Institution) notified to the students well in advance every Friday.

5.2 Declaration of Result and Certification

- The modus operandi of evaluation is the same as followed by the Examination Boards. The evaluation is done by a panel of evaluators in on the spot evaluation mode. Each Question paper is given a unique fictitious QB Code. The evaluation is based on the NIOS scheme of examination. The result is declared and published through NIOS website (www.nios.ac.in).

6. What Learners say about ODE

Some of the views of learners about ODE are as follows

- As this system is very flexible in terms of the examination date, one can prepare for the examination according to one's availability of time.
- They get enough time for preparation and they can improve as many times as they want.
- There is no fix time for registration. The students can register on any day for writing the examination.
- We can plan to appear in the examination as per our preparation and get the chance to re-appear immediately in the very next month.
- Many students could save their one precious year and joined standard 12th in the regular stream after clearing standard 10th through ODE.

Epilogue

Implementation of the On-Demand Examination has proved that it is learner centric, learner friendly and stress free examination system. It has established transparency in the examination system. Use of ICT has facilitated generation of 5.3X10⁴ different Question papers from mere 1000 Items in its Item Bank.

The On Demand Examination is conducive to establish the autonomy of learner in the pace of study. With the introduction of Round the Year Online Admission and On-Demand Examination, NIOS has brought a revolutionary change in the education system.