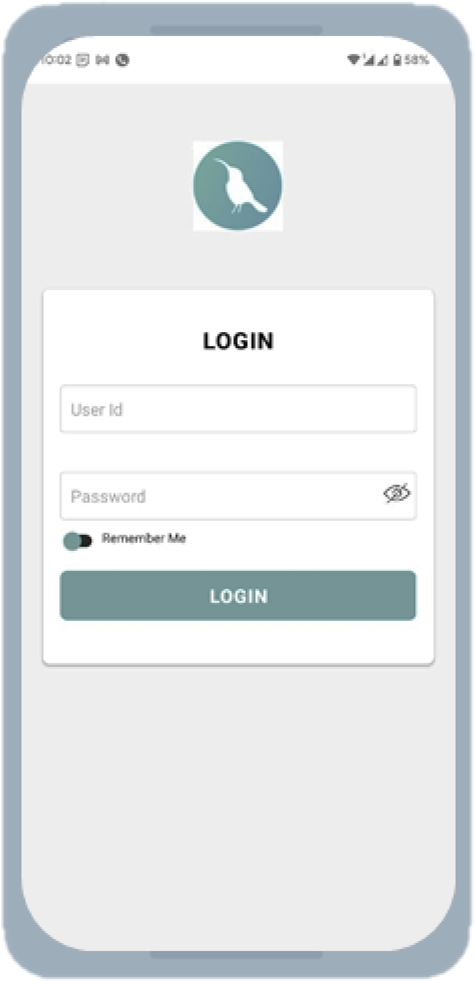
Saral

Implementation Manual



Content

1. <u>Introduction to Saral</u>

1.1 What is Saral

Sunbird Saral attempts to create a connection between the information that exists in the physical world and ties it to digital structured information.

Saral, literally meaning simplicity, has been conceptualized to enable users to create structured digital information using mobile devices. The process is also called Saralify or Phygitization. Saral should be viewed as an OCR-plus (optical character recognition plus) application that is capable of doing OCR and can also understand the structure of the physical input.

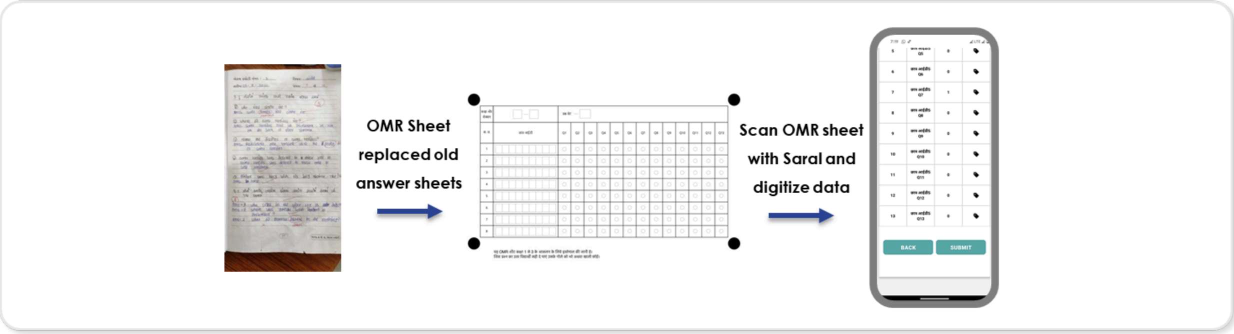
Saral reference app works as an edge location solution to phygitize data on physical layout printed sheets and upload the data to the backend. This backend data will be then pushed to an Analytics system for insights and take actions accordingly.

1.2 Saral value proposition

The ability to generate structured digital data from a physical document even in an offline environment is an unparalleled feature of SARAL. The app is extensible to include more forms as needed for digitization

1.3 Current Use Case

At present, Saral is utilized for carrying out large-scale assessments at a census level, combining both physical and digital elements with the use of OMR sheets and Saral App.


OMR Sheet replaced old answer sheets
Scan OMR sheet with Saral and digitize data
BACK
SUBMIT

2. Get ready for Saral based Assessments

2.1 Product Readiness

2.1.1 Production Setup

Hardware Requirement

The following minimum configuration works for a scale as detailed below:

3,000 Users (*with peak concurrency of 500-1000 users*) can Successfully Login and Submit the Marksheet for 4,50,000 Students at a 1500 *students save per second*. Test Duration 5 Minutes with average response time of 10-20 Seconds with 100% Success rate

Server	Instance Type	CPU	Memory	Disk	No. Of Servers
Jenkins CI/CD	m5a.large	2	8	50	1
Monitoring and logging	m5a.xlarge	4	16	50	1
EKS nodes	c5a.xlarge	4	8	50	2
MongoDB standalone	m5a.xlarge	4	16	100	1
This is optional if you want scale or else standalone is enough					
MongoDB as sharded cluster(3 sharded cluster)	m5a.xlarge	4	16	100	8
mongoconfig	m5a.large	2	8	50	2

Network Ports requirement:

1. 80 (nginx is configured in jenkins)
2. 443 (nginx is configured in jenkins)
3. 3005 (required to launch node server)
4. 27017(to launch mongodb)
5. 8080(for jenkins)
6. 22(for ssh login to EC2)
7. 5601(kibana dashboard for logging access)
8. 30005(monitoring infra using Prometheus)
9. 30001(Grafana dashboards)
10. 9001(node exporter)

2.1.2 Local/development setup

Hardware requirements

We recommend following hardware requirements as minimum requirements to set up the Saral backend.

One server is required with the following configurations:

1. Any OS
2. 16 GB of System RAM (minimum requirement)

3. 4 core CPU (minimum requirement)
4. 250GB HDD

Network Ports requirement:

1. 3000(required to launch node server)
2. 27017(to launch mongodb)

2.1.3 Human capital

Type	Language / Skills	Experience	Full-time people
Backend Developer	NodeJs, JavaScript, Express.js,Postman, MongoDB Compas, SonarQube, Github, Jest Unit testing, Swagger documentation	3+ years	1
DevOps	Docker, AWS, KUBERNETES,jenkins,SCM tools, Grafana, Prometheus,EFK stack, Terraform	3+ years	1
QA	UAT	3+ years	1
Tech Lead	All of the above, & management skills	5+ years	1
Frontend Developer	React Native	3+ years	1
AI	Based on need	3+	1

2.2 Program Readiness

2.2.1 System integrator Onboarding / In House MIS Unit

This step involves the process of onboarding a system integrator or establishing an in-house Management Information System (MIS) unit for the program. The SI or MIS unit is responsible for setting, managing, and maintaining the Saral frontend and backend operations, Database management and result evaluation after assessment. This includes identifying and selecting the right IT professionals or vendors with the necessary expertise to handle the technical aspects of the program.

2.2.2 Identification and setting up of Database for Assessments

In this step, the focus is on identifying and setting up the necessary databases to store information about **schools, students and teachers** participating in the assessment. These databases will serve as the foundation for various assessment activities, including enabling logins, students mapping with various schools, student wise submission of answer sheets etc. . It's important to define the data fields, data structures, and access controls for these databases to ensure data accuracy, security, and integrity.

Saral Database Schema:

1. Schema details of different collections:
   - Brand

Key Name	Type	Required

logoImage	String	true
themeColor1	String	
themeColor2	String	
themeColor3	String	
themeColor4	String	
themeColor5	String	
appName	String	true
state	String	
supportIcon	String	
Logout	String	
About	String	
Support	String	
Help	String	
screenLabels	object	
ClearCache	String	

- Classes

Key Name	**Type**	**Required**
className	String	true
classId	String	true
sections	Array	
schoolId	String	true

- Counters

Key Name	**Type**	**Required**
counter_value	Number	
_id	String	true

- Exams

Key Name	**Type**	**Required**
examId	Number	true
classId	String	true
type	String	true
schoolId	String	
examLO	String	true

examDate	String	
subject	String	true
set	Array	
totalMarks	Number	true
questions	object	
state	String	

- locks

Key Name	Type	Required
lockType	String	true
lockId	String	true

- Marks

Key Name	Type	Required
examId	Number	
classId	String	true
schoolId	String	true
examDate	String	
subject	String	true
set	String	
totalMarks	Number	true
section	String	true
studentId	String	true
studentIdTrainingData	Array	
predictedStudentId	String	
predictionConfidence	Array	
studentAvailability	Boolean	true
marksInfo	Array object	
totalMarks	Number	true
maxMarksTrainingData	Array	
maxMarksPredicted	String	
maxMarksConfidence	Array	
maxMarksTrainingData	Array	
securedMarks	Number	true
obtainedMarksTrainingData	Array	

obtainedMarksPredicted	String	
obtainedMarksConfidence	Array	
createdOn	String	
roiId	String	
shardedKey	String	true
userId	String	true

- Roi

Key Name	Type	Required
subject	String	true
classId	String	true
roiId	String	true
roi	object	true
set	String	
state	String	true
type	String	

- Schools

Key Name	Type	Required
name	String	true
schoolId	String	true
autoSync	Boolean	
autoSyncFrequency	Number	
autoSyncBatchSize	Number	
tags	Boolean	
isMinimalMode	Boolean	
supportEmail	String	
isAppForceUpdateEnabled	Boolean	
offlineMode	Boolean	
isManualEditEnabled	Boolean	
scanTimeOutMs	Number	
district	String	true
isFBAnalyticsEnabled	Boolean	
block	String	

useCase2	Boolean	
useCase3	Boolean	
useCase4	Boolean	
useCase5	Boolean	
state	String	true

- Students

Key Name	**Type**	**Required**
name	String	true
studentId	String	true
fatherName	String	
classId	String	true
className	String	true
schoolId	String	true
section	String	

- Users

Key Name	**Type**	**Required**
name	String	true
userId	String	true
schoolId	String	true
password	String	true

For more details on collection schemas refer:
https://github.com/Sunbird-Saral/Project-Saral/tree/main/v1.0/backend/src/models

2. Additionally find sample data for these schemas in below link:
   https://github.com/Sunbird-Saral/Project-Saral/tree/main/v1.0/backend/data

2.2.3 Identify central body for setting up centralized question papers

This step involves determining the central authority or organization responsible for creating and managing the question papers for assessments. The central body plays a crucial role in ensuring the quality, consistency, and security of question papers.

Creating centralized question papers is a pivotal and critical stage in census-level, saral assessments. It is essential to ensure uniformity across the entire state and facilitate result generation by encoding answer keys in the backend system. Without standardized question papers, it becomes exceedingly challenging to correlate students with their respective question paper sets and subsequently encode each set in the backend system for result processing.

2.2.4 Finalize operations for Question paper printing and distribution

This step involves finalizing the end-to-end operations and workflows for the printing, and distribution of question papers. It includes defining the roles and responsibilities of individuals involved in these processes, implementing quality control measures, and ensuring compliance with security protocols to prevent any unauthorized access to assessment materials.

Different choices can be considered depending on the existing infrastructure and available resources for this particular step:-

Option 1: Centralized Question Paper Printing and Distribution

If printing facilities are not available at school level, we suggest centralized printing, packaging and distribution of question Papers to schools. In this case, the state will need to do an RFP for printing, packaging and distributing question papers centrally at a school level for all the students.

Option 2: Decentralized Question Paper Printing and Distribution

In cases where schools have access to printing or projector facilities, question papers can be shared on the day of assessment to be printed or projected for all students in the school.

2.2.5 Finalize operations for OMR sheet printing and distribution

Similar to the previous step, this step focuses on the operations and processes related to the printing and distribution of OMR sheets to be used by students during assessment. It entails specifying the printing specifications, number of OMR sheets to be printed, handling logistics, and establishing security measures to safeguard the integrity of OMR sheets from production to distribution.

2.2.4 Set up query resolution center

The establishment of a query resolution center is essential for addressing inquiries, concerns, and issues raised by teachers, or other stakeholders participating in the assessments. This center serves as a centralized point of contact where individuals can seek assistance, clarification, or information related to the Saral App and Operations. It requires defining the communication channels, staffing, and processes for handling queries effectively.

These steps collectively contribute to the preparedness for Saral based Assessments.

3. Set up Saral Frontend and Backend for conducting assessments

3.1 Setting up Saral Frontend

Source Code references

1. Open Terminal and clone source code git clone https://github.com/Sunbird-Saral/Project-Saral.git.
2. Change Directory to Project-Saral/ folder and switch to release tag as per release notes. git checkout tags/<tag_name>
3. $FRONTEND_FOLDER = Project-Saral/v1.0/frontend

Installation and Setup

1. Setting up the React Native development environment Note: Choose React Native CLI Quick Start tab for setup instructions.
2. Download NDK 20.0.5594570 and extract the archive to the $ANDROID_HOME\ndk folder.
3. In Android Studio, navigate to File\Project Structure\SDK Location and set Android NDK location to $ANDROID_HOME\ndk\android-ndk-r20 (extracted in the last step).
4. Make sure sdk.dir paths are set properly in frontend\SaralApp\android\local.properties.
5. Register on Google Firebase, add the Saral project on the firebase dashboard and download the corresponding google-services.json.
6. Place downloaded google-services.json under the frontend/SaralApp/android/app folder.
7. Once Vysor and AVD are configured as per the instructions, follow the below steps to bring up the application.
8. Open a terminal in frontend/SaralApp and run npm in the command.
9. cd android && ./gradlew clean && cd ..
10. Make sure backend BASE_URL is configured in frontend/SaralApp/src/configs/config.js file.
11. npx react-native run-android
12. Successful frontend deployment should show Saral OCR login screen on AVD or USB connected Android device

Generate keystore file

1. For generating keystore file run this command
2. keytool -genkey -v -keystore my-release-key.keystore -alias my-key-alias -keyalg RSA keysize 2048 -validity 10000

Generating APK from source code

1. open Terminal in frontend/SaralApp/android folder
2. Run command. /gradlew clean
3. APK Signing can be enabled using the below Gradle files. Make sure the Keystore file is to be used for signing placed in the frontend/SaralApp/android/app folder.
4. Change alias and password in frontend/SaralApp/android/gradle.properties
   MYAPP_RELEASE_STORE_FILE=my-upload-key.keystore
   MYAPP_RELEASE_STORE_PASSWORD=changeit
   MYAPP_RELEASE_KEY_ALIAS=hwrecog-key-alias
   MYAPP_RELEASE_KEY_PASSWORD=changeit

5. Open Terminal in the frontend / SaralApp / android folder and run the command. / gradlewassembleRelease
6. You can find the release apk file in Project-Saral/v1.0/frontend/SaralApp/android/app/build/outputs/apk/release folder

Generate AAB (App bundle) from source code

1. open Terminal in frontend/SaralApp/android folder
2. Run command. /gradlew clean
3. APK Signing can be enabled using the below Gradle files. Make sure the Keystore file is to be used for signing placed in the frontend/SaralApp/android/app folder.
4. Change alias and password in frontend/SaralApp/android/gradle.properties
   MYAPP_RELEASE_STORE_FILE=my-upload-key.keystore
   MYAPP_RELEASE_STORE_PASSWORD=changeit
   MYAPP_RELEASE_KEY_ALIAS=hwrecog-key-alias
   MYAPP_RELEASE_KEY_PASSWORD=change it
5. Open Terminal in frontend/SaralApp/android folder and run command ./gradlewassembleRelease
6. You can find the release apk file in Project-Saral/v1.0/frontend/SaralApp/android/app/build/outputs/apk/releases/app-release.aab folder

Debugging/running saral from android studio

1. Open **frontend/SaralApp/android** folder from Android Studio.
2. Run npx react-native start command from Terminal in **frontend/SaralApp** the directory.
3. Run adb reverse tcp:8081 tcp:8081 from another terminal
4. Now click on the Run or Debug button from Android studio.
5. When you are debugging, have debug breakpoints in android code as needed for troubleshooting.

Google Play Store App Publish

Refer to Developer Program Policy for more details. These policies can be changed by google from time to time, so please refer to the latest policies before publishing the App in the playstore.

Privacy Policy for Apps to be listed in the playstore to be generated and publish this policy of the app as a URL. The same Privacy Policy URL needs to be added in the play store "Store Listing" section of your application before publishing the Application.

Misleading Claims Google team reviews the app content including logos , images , content to see if any misleading claims. For example "government affiliation or authorization to facilitate government services through your app". An Advance Notice Form to be submitted for any such affiliations or claims for google team to review it.

3.2 Setting up Saral Backend

Prepare necessary hardware requirement for development environment

1. Sample Hardware configuration snapshot
    a. Any OS
    b. 16 GB of System RAM (minimum requirement)
    c. 4 core CPU (minimum requirement)
    d. 250GB HDD

Clone the project repo

1. Open Terminal and clone source code "git clone https://github.com/Sunbird-Saral/Project-Saral.git."

Install necessary dependencies

1. The above cloned repo uses nodejs and mongodb technologies. If you wish to continue with the same please follow installation steps provided in previous steps.
2. If you wish to use a different tech stack like Java instead of NodeJs and mysql instead of mongodb. Please use the above repo code as reference and build REST APIs by referring to postman collection (https://github.com/Sunbird-Saral/Project-Saral/blob/v1-develop/v1.0/backend/test) for endpoint details.

Database Setup/Data Ingestion

a. The reference saral backend uses mongodb as Database, but you can use any database with necessary schemas. To know different schemas/Tables Refer path Project-Saral\v1.0\backend\src\models
b. Find sample/Initial data to be loaded under path Project-Saral\v1.0\backend\data

Data Processing

You can use any API testing tool like POSTMAN to test API endpoints. To know about sample payload and responses refer https://github.com/Sunbird-Saral/Project-Saral/blob/v1-develop/v1.0/backend/test

4. Steps for conducting saral based assessments

Once the saral backend and front end is set up, we can start with operations required for saral assessment.

1. **Upload Latest Saral App on Playstore**

This step involves the process of uploading the most recent version of the Saral App to the Google Play Store. This ensures that users have access to the latest features, improvements, and bug fixes.

2. **Finalize schedule of assessment (For example: 1 day, 2 day, based on grades and scale)**

In this step, a schedule for conducting assessments is determined. The schedule may vary based on factors such as grade levels and the number of days required for the assessments. It is important to establish clear dates and timelines for the assessment activities.

Sample schedule from Saral based assessment in Uttar Pradesh:

Date	Day	Exam	Mandal 1	Mandal 2	Mandal 3	Mandal 4	Mandal 5	Mandal 6
11-Sep-2023	Monday	Class 1-3	Lucknow	Ayodhya	Prayagraj	Saharanpur	Kanpur	Bareilly
12-Sep-2023	Tuesday	Class 4-8	Lucknow	Ayodhya	Prayagraj	Saharanpur	Kanpur	Bareilly
13-Sep-2023	Wednesday	Class 1-3	Gorakhpur	Varanasi	Chitrakoot	Meerut	Aligarh	Jhansi
14-Sep-2023	Thursday	Class 4-8	Gorakhpur	Varanasi	Chitrakoot	Meerut	Aligarh	Jhansi
15-Sep-2023	Friday	Class 1-3	Devipatan	Moradabad	Azamgarh	Agra	Basti	Mirzapur
16-Sep-2023	Saturday	Class 4-8	Devipatan	Moradabad	Azamgarh	Agra	Basti	Mirzapur
22-Sep-2023	Monday		**RESULTS PUBLISHED**					

3. **Question paper setting by identified authority for all grades to be assessed**

The identified authority is responsible for creating question papers for all grades participating in the assessments. Question papers may need to be prepared in multiple sets to accommodate the assessment schedule and requirements.

4. **Print and distribute OMR sheets and Question papers**

This step involves the physical production and distribution of OMR sheets and question papers to the assessment centers or schools. It is crucial to ensure that the necessary materials are delivered accurately and securely.

5. Prepare training collaterals for the teacher and on ground staff training

Training materials and resources are developed in this step to facilitate the training of teachers and on-ground staff involved in the assessment process. These materials should be comprehensive and user-friendly.

Sample Training Deck from Saral Based Assessments in Uttar Pradesh: Training Deck, FAQ Training Deck

6. Training of teachers and staff

Teachers and on-ground staff are provided with the necessary training to prepare them for their roles in conducting assessments. This training ensures that they understand the process and procedures involved.

Whenever feasible, ensure that two rounds of training are conducted before the assessments take place.

7. Define SOPs for issue resolution operators

Standard Operating Procedures (SOPs) are established for operators working in the issue resolution center. These procedures provide guidelines for addressing and resolving queries, issues, and concerns from ground.

Sample SOP for Issue resolution operators in Uttar Pradesh: SOP for issue resolution operators

8. Training of operators for resolving bugs and queries

Operators in the issue resolution center are trained to effectively handle and resolve technical issues, bugs, and queries that may arise during the assessment period.

9. Set up mechanism for documenting all queries coming from ground in a standardized format

A structured mechanism is put in place to document all queries received from the field in a standardized format. This helps in organizing and tracking the issues for timely resolution. A complaint redressal system may also be established for this purpose.

10. Finalize live dashboards for monitoring

The process and wireframes for creating live monitoring dashboards is finalized. These dashboards are essential for tracking assessment progress and providing real-time insights into the data.

11. Develop result dashboards

These dashboards will display assessment results after the results are generated in the required format

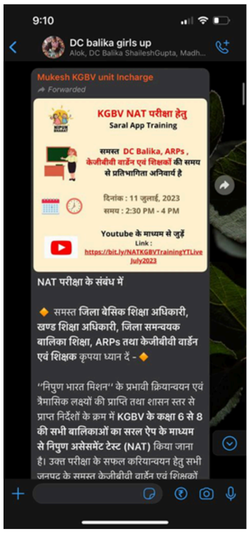
12. Enable logins of teachers for data checking on the App

Teachers are provided with login credentials to access and review student data mapped to their login, class and school on the Saral App. This will also help them to familiarize themselves with the App

13. Continuous communications for better reach to all teachers

Communication strategies to be implemented to ensure that all teachers are informed about the assessment process and any updates or changes. Simple infographics, whatsapp messages, Videos, posters can be used for the same.

Sample infographics and whatsapp messages from saral assessments in Uttar Pradesh:



9:10

DC balika girls up
Alok, DC Balika ShaileshGupta, Madh...

Mukesh KGBV unit Incharge
Forwarded

KGBV NAT परीक्षा हेतु
Saral App Training

समस्त DC Balika, ARPs , केजीबीवी वार्डेन एवं शिक्षकों की समय से प्रतिभागिता अनिवार्य है

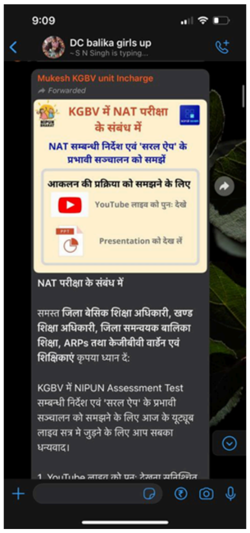
दिनांक : 11 जुलाई, 2023
समय : 2:30 PM - 4 PM

Youtube के माध्यम से जुड़ें
Link : https://bit.ly/NATKGBVTrainingYTLiveJuly2023

NAT परीक्षा के संबंध में

🔶 समस्त जिला बेसिक शिक्षा अधिकारी, खण्ड शिक्षा अधिकारी, जिला समन्वयक बालिका शिक्षा, ARPs तथा केजीबीवी वार्डेन एवं शिक्षक कृपया ध्यान दें - 🔶

"निपुण भारत मिशन" के प्रभावी क्रियान्वयन एवं त्रैमासिक लक्ष्यों की प्राप्ति तथा शासन स्तर से प्राप्त निर्देशों के क्रम में KGBV के कक्षा 6 से 8 की सभी बालिकाओं का सरल ऐप के माध्यम से निपुण असेसमेंट टेस्ट (NAT) किया जाना है। उक्त परीक्षा के सफल करियान्वयन हेतु सभी जनपद के समस्त केजीबीवी वार्डेन एवं शिक्षकों



9:09

DC balika girls up
~S N Singh is typing...

Mukesh KGBV unit Incharge
Forwarded

KGBV में NAT परीक्षा के संबंध में

NAT सम्बन्धी निर्देश एवं 'सरल ऐप' के प्रभावी सञ्चालन को समझें

आकलन की प्रक्रिया को समझने के लिए

YouTube लाइव को पुन: देखे

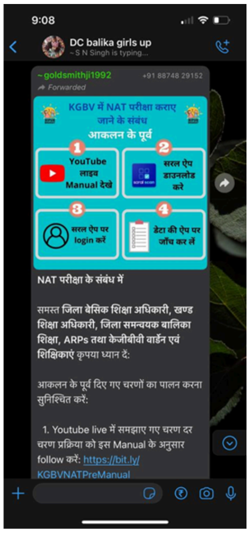
Presentation को देख लें

NAT परीक्षा के संबंध में

समस्त जिला बेसिक शिक्षा अधिकारी, खण्ड शिक्षा अधिकारी, जिला समन्वयक बालिका शिक्षा, ARPs तथा केजीबीवी वार्डेन एवं शिक्षिकाएं कृपया ध्यान दें:

KGBV में NIPUN Assessment Test सम्बन्धी निर्देश एवं 'सरल ऐप' के प्रभावी सञ्चालन को समझने के लिए आज के यूट्यूब लाइव सत्र मे जुड़ने के लिए आप सबका धन्यवाद।

1. YouTube लाइव को पुन: देखना सुनिश्चित



9:08

DC balika girls up
~S N Singh is typing...

~goldsmithji1992 +91 88748 29152
Forwarded

KGBV में NAT परीक्षा कराए जाने के संबंध
आकलन के पूर्व

1 YouTube लाइव Manual देखे

2 सरल ऐप डाउनलोड करे

3 सरल ऐप पर login करें

4 डेटा की ऐप पर जाँच कर लें

NAT परीक्षा के संबंध में

समस्त जिला बेसिक शिक्षा अधिकारी, खण्ड शिक्षा अधिकारी, जिला समन्वयक बालिका शिक्षा, ARPs तथा केजीबीवी वार्डेन एवं शिक्षिकाएं कृपया ध्यान दें:

आकलन के पूर्व दिए गए चरणों का पालन करना सुनिश्चित करें:

1. Youtube live में समझाए गए चरण दर चरण प्रक्रिया को इस Manual के अनुसार follow करें: https://bit.ly/KGBVNATPreManual

14. Complete data check process

A thorough data check and data updating process is carried out one week before the assessments to ensure that all the student data is accurate and up to date, reducing the risk of errors during assessments.

15. Enable teacher logins

On the day of the assessment, enable teacher logins required to conduct the assessments smoothly.

16. Conduct assessments

Assessments are conducted as per the schedule, and all completed OMR sheets are scanned and submitted by teachers using Saral App

17. Codify answer keys in the backend for result evaluation

The answer keys for the assessments are encoded into the backend system, which is crucial for accurate result evaluation

18. Evaluate results and publish on the dashboards

Results of the assessments are carefully evaluated, and the outcomes are published on the designated dashboards for stakeholders to access.

19. Feedback from teachers

Feedback from teachers and participants is gathered to identify areas for improvement and further enhancements in the assessment process.

20. Define and take post assessment actions on the results

After the assessments are complete and results are published, specific actions and decisions are made based on the assessment outcomes, which may include academic interventions or future planning.

These steps collectively represent the detailed process involved in planning, conducting, and evaluating the assessments while ensuring effective communication, training, and technical support.

5. Sample Work plan with estimated duration for each step

#	Items	Timeline	Can startright after T	Followed by Previous action Item
1	Saral backend and frontend ready	T	_	
2	Database to be used for assessments identified and deployed on backend	T	_	
3	All steps completed for finalizing program readiness (Identifying central body for preparing question papers, set up issue resolution center etc.)	T	_	
4	Assessment schedule finalized	T+2	🟩	
5	Saral App tested and uploaded on play store	T+5	🟩	
6	Question papers prepared and verified	T+6	🟩	
7	Bid uploaded and work order released for printing QP and OMR sheets centrally	T+10	🟩	
8	Printing and Packaging of QP and OMR completed	T+30		🟨
9	Distribution of QP and OMR sheets to schools completed	T+40		🟨
10	Teacher training collaterals and SOPs for issue resolution operators ready	T+10	🟩	
11	Trainings completed for teachers, on ground staff and Issue resolution operators	T+35		🟨
12	Teacher logins enabled for data checking	T+36		🟨
13	Student Data checking by teachers completed on the Saral App	T+42		🟨
14	Student data updated and locked on backend	T+44		🟨
15	Teacher logins enabled for assessment/Assessments conducted	T+50		🟨
16	Development completed for live monitoring	T+25	🟩	

	dashboards and result dashboards		🟩	
17	Answer keys for result evaluation codified in the backend	T+50	🟩	
18	Results evaluated and declared	T+56		🟨