





RM: An Android Mobile Application for the Course Research Methodology – A New Way of Learning the Course

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Abstract. Mobile applications are used for improving and engaging the students as well as teacher in teaching-learning process. The effectiveness as well as the impact of the mobile application can be seen in various fields such as medical education, health care system, engineering education, etc. Keeping this in mind, the mobile application for the very important course Research methodology is developed which will be useful to all UG, PG and PhD students of any stream. The preliminary study related to the mobile app is considered using the previous version of the app. Using the feedback of previous version of the app, the changes are made in the old version of this mobile app and new version are made available to the students. The link for this app on Google Playstore is link -<https://play.google.com/store/apps/details?id=in.smd.rmversion>. This app contains the PPTs, Notes, Multiple Choice Questions as well as Subjective Questions, Revision Part for revising the various topics of the this course, Test Your Knowledge part for testing the knowledge about this course and Quiz covering all units. In present study, the research question “Whether an android mobile app engage the learners and help them to understand the topics of this course by practicing the quiz and testing the knowledge through Test Your Knowledge section of this app?”.

In current study, this app was given to the forty five PhD research scholars for studying purpose. One group post-test method was conducted to check the effectiveness of this app. It is found from result analysis that there is significant improvement in the result which is verified using statistical analysis t-test. Feedback for this new version is also considered and presented in this paper.

Keywords: Research Methodology · Android Mobile Application · Quiz · Likert’s scale · Feedback · Multiple Choice Questions

1 Introduction

According to Clifford Woody, research comprises of.

- Defining and redefining problems,
- Formulating hypothesis or suggested solutions;
- Collecting, organizing and evaluating data;

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- Making deductions and reaching conclusions; and
- At last carefully testing the conclusions to determine whether they fit the formulating hypothesis.

Research Methodology is a way to solve the research problem. So the course Research Methodology is a very important course to undergraduate students, postgraduate students, and research scholar of any stream including science, engineering, commerce, social science, etc. Also mobile app plays important role by engaging the students in teaching-learning process. So the mobile app is developed for this course so that it will be useful for all students while learning this course.

2 Literature Survey

The findings related to the use of mobile in education proved the effectiveness as well as its impact in teaching-learning process. There are various mobile applications such as SysPro for System Programming [5], vectorialZ application for Mathematics learning [9], Business English learning [4], Programming concepts [6], Health technology [7], School education [8], Radiology education [10], Fitness [11], etc.

Wang, Y., & Collins, W. B. [11] considered the review of mobile applications such as “Tutor”, “Recorder”, “Game Companion”, and “Cheerleader”.

The article written by the author Wong, C. Y. and et. al. [2] discussed the design practice as well as education towards developing mobile apps implemented in institute of Malaysia. To design an effective mobile app, an attractive aesthetical visual of user interface design is important. Also the success of the mobile app depends on an enhanced usability and seamless user experience for the targeted users.

Oyelere, S. S. and et. al. [6] considered the integration of puzzle-based Parson’s programming exercises into a strategy board game. The aim of the study was to facilitate the teaching and learning of programming.

In the study by Guo, Y., et.al. [7], the pilot trial is considered in patients with atrial fibrillation. It demonstrated that this approach translated significantly improved knowledge, drug adherence, anticoagulant satisfaction, and quality of life.

So in this study, the mobile app for the course Research Methodology is considered.

3 RM Content

Research Methodology (RM) course contains various important topics such as

- What is research and characteristic research
- Research process to be carried out while doing the research in any stream.
- What is the role of Information and Communication Technology (ICT) in research
- Literature review and related terminologies
- Important steps in research methods
- Basic research terminologies
- Various data collection methods
- Applied statistics

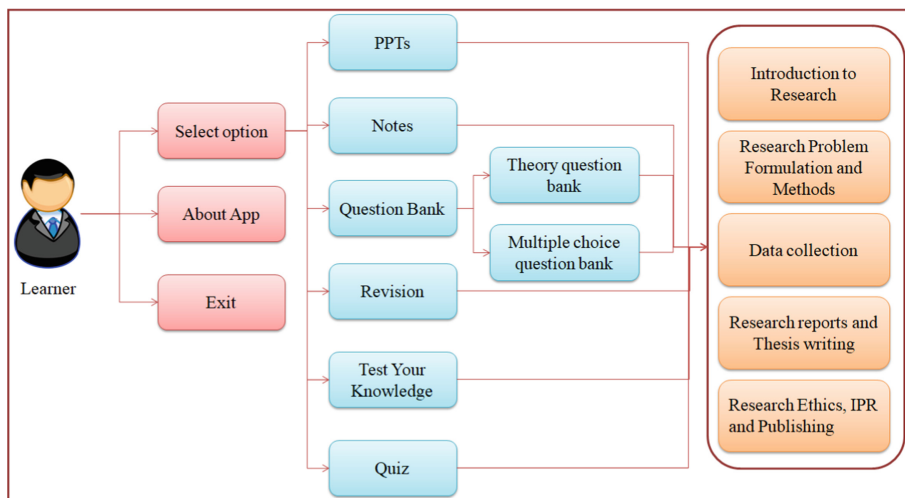


Fig. 1. RM Mobile Application Content

- Research report and thesis writing
- Importance of effective communication
- Ethical issues
- Intellectual property rights
- Publishing the research articles.

So all these contents are covered in the app in the form of PPTs and Notes. Also the question bank – theoretical as well as multiple choice questions, quiz, revising the content, and testing the knowledge is covered in this app. This app contents are given in the Fig. 1 explained in detailed in the following sections. The app is downloadable from the link -<https://play.google.com/store/apps/details?id=in.smd.rmversion>.

This app contains - Power Point presentations, Notes, Question Bank, Revision, Test Your Knowledge, Quiz, and About App.

3.1 Power Point Presentations

Power point presentation provides the visual presentation which has long term effect on performance of students. Using graphics, text and proper color combination, these PPTs engage and retain the students effectively. For each unit of this course, PowerPoint presentation is given which has the same format. The each unit PPT contain

- Introduction slide containing the name of unit
- Learning outcomes – what the students will be able to learn at the end of this presentation.
- Topics that are covered in unit
- Contents of unit covering the topics mentioned in the above slide
- References used to prepare this presentation. These references can be book or URL

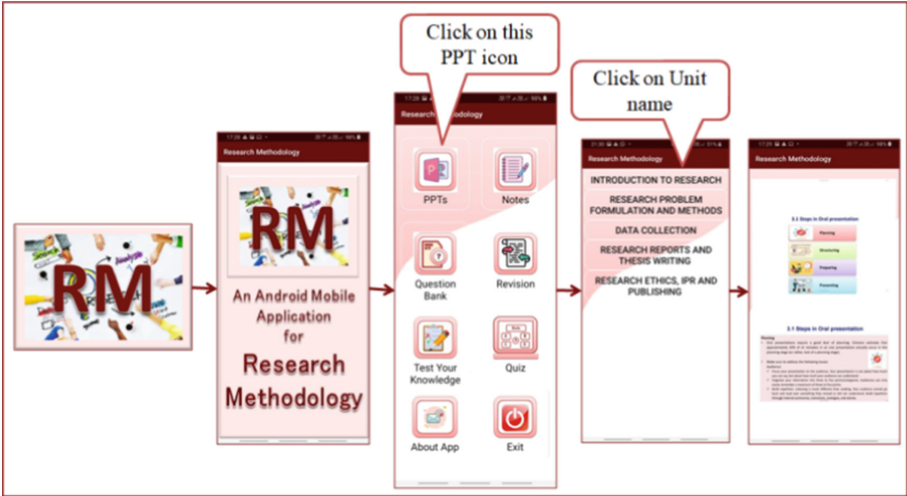


Fig. 2. Steps for reading PPTs

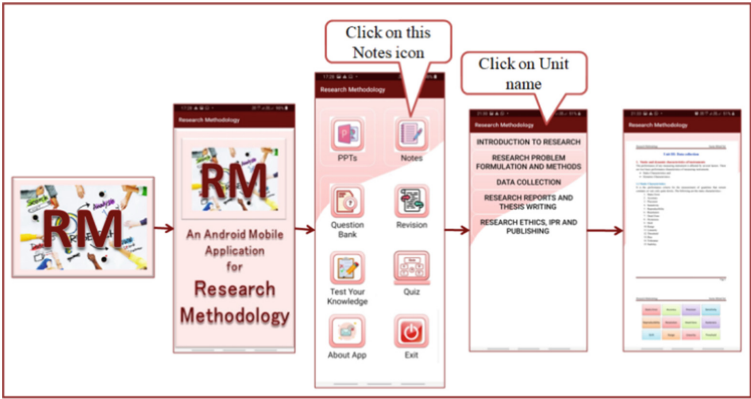


Fig. 3. Steps to go through the Notes

As shown in Fig. 2, click on the PPT icon which will show you the list of unit names and go through these PPTs by clicking on particular unit name.

3.2 Study Material

Study material i.e. notes for each unit of this course is not available in one book or not at a one place. So here notes related to each unit is provided along with the references used at end. In reference part, the topic name along with the URL or book from which that topic is referred is given. The steps used to go through the notes of each unit in this app are shown in Fig. 3.

Table 1. Number of questions considered

Sr. No.	Unit name	Number of theory questions	Number of MCQs
1	Introduction to Research	11	40
2	Research Problem Formulation and Methods	20	60
3	Data collection	26	100
4	Research reports and Thesis writing	13	20
5	Research Ethics, IPR and Publishing	10	40

3.3 Question Bank

There are two types of questions considered in the app.

Theory Question Bank.

Multiple Choice Question Bank.

A. Theory Question Bank – This question bank contains the probable theory question on each unit.

B. Multiple Choice Question Bank – This question bank contains multiple choice questions for each unit.

Both these question banks will help the students at the time of examination. The number of theory questions as well as multiple choice questions for each unit is given in Table 1.

The steps to go through the question bank along with the instructions are shown in following Fig. 4. To check the answers of multiple choice questions, students/ learners have to attempt the Quiz part.

3.4 Revision

Revision is a very important part in this application. This part is useful for revising various main topics of each unit. Sample topics for unit number 1- Introduction to Research are as follows

- Characteristics of Research
- Types of Research
- Other Types of Research
- Basic approaches to research
- Research Process
- Types of Samples
- Survey methods
- Problem Solving Process

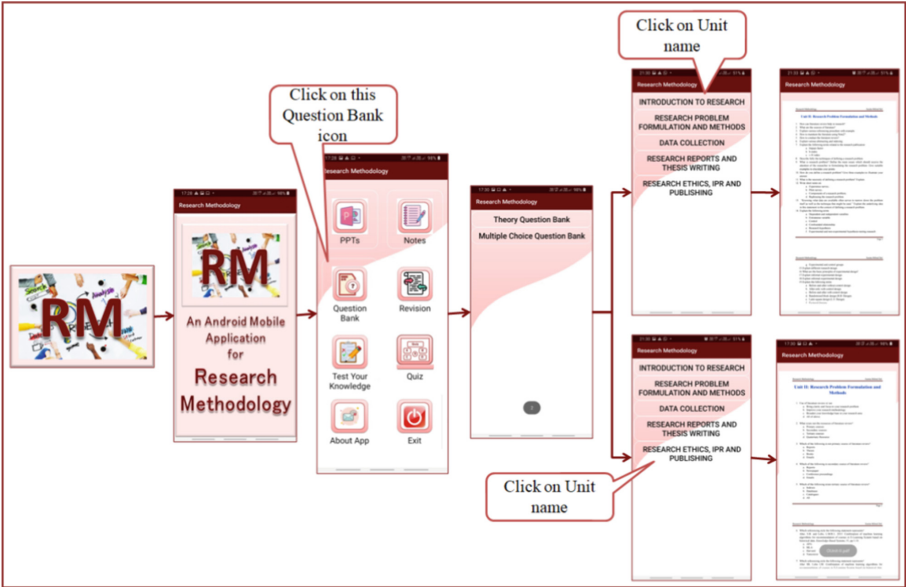


Fig. 4. Steps to go through the Question Bank

Table 2. Number of topics considered for revision of each unit of the course

Sr. No.	Unit name	Number of topics considered
1	Introduction to Research	8
2	Research Problem Formulation and Methods	12
3	Data collection	19
4	Research reports and Thesis writing	15
5	Research Ethics, IPR and Publishing	15

For each topic, contents are given in the form of the diagram. Students usually remember the contents shown visually as compared to displaying the content as listing. The number of topics considered for each unit for revision is given in Table 2.

How to go through the revision part of each each topic of each unit is shown in Fig. 5.

3.5 Test Your Knowledge

This mobile application contains the ‘test your knowledge’ to test the knowledge about this course. Number of questions considered to test the knowledge of each unit is given in Table 1.

The steps to attempt this Test Your Knowledge part is given in Fig. 6.

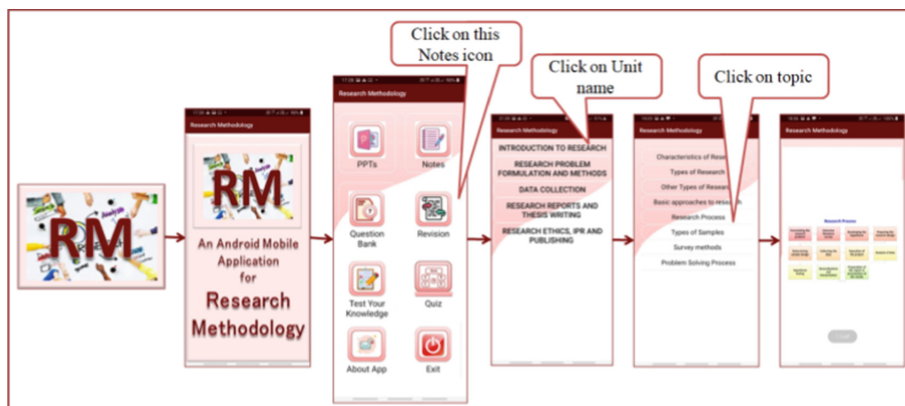


Fig. 5. Steps to go through the revision

Table 3. Number of Questions in Test Your Knowledge

Sr. No.	Unit name	Number of question
1	Introduction to Research	7
2	Research Problem Formulation and Methods	12
3	Data collection	22
4	Research reports and Thesis writing	14
5	Research Ethics, IPR and Publishing	12

The purpose of adding the ‘Test Your Knowledge’ in this app is to test students/learners’ knowledge about this course. Steps to attempt the ‘Test Your Knowledge’ is given below-

- Step 1 – Click on ‘Test Your Knowledge’
- Step 2 – Select the unit name of this course
- Step 3 – After step 1 and 2, the screen will be displayed consisting of four parts
 - Number of Questions remaining
 - Question textbox
 - Options part
 - Button NEXT
- Step 4 - If the clicked option/s is/are the correct then that/those option/s will be disappeared and even if the wrong options are clicked, then it will not get disappeared.
- Step 5 - If all correct options are chosen then click on the NEXT button to go the next question

- Step 6 - If the learner does not click on all correct option/s and click on the NEXT button, the message will be displayed on the screen – “Still some correct options are there”

For attempting remaining questions also, follow the above steps 3 to 5.

3.6 Quiz

Quiz is very important as it will help in revising the content as well as to check the depth of students/ learners' knowledge. In quiz, two types of questions are considered

- Single correct answer and
- Multiple correct answers.

Quiz part consist of three parts-

- Question
- Options

In case Single correct answer, radio buttons are used and in case multiple correct answers, check box are used.

- Three buttons – CHECK, NEXT and FINISH

In case of Single correct answer, after clicking on the answer, the clicked answer cannot be changed. If the option selected is the correct answer then the message will be displayed - ‘Answer is correct’ otherwise the message will be – ‘Wrong Answer and Correct Answer – correct option number’. After this, click on NEXT button to go to the next question.

In case multiple correct answers, after clicking on the answer/s, click on CHECK button to check the answer and the clicked answer cannot be changed. If the option/s selected is/are the correct answer/s then the message will be displayed - ‘Answer is correct’ otherwise the message will be – ‘Wrong Answer and Correct Answer – correct option number/s’. After this, click on NEXT button to go to the next question.

The button FINISH can be clicked any time to come out of the quiz. After clicking on FINISH button, the result is shown which contains

- Total number of questions in the particular unit
- Total number of questions attempted
- Total correct question attempted by student and

Total score obtained by student.

The steps to attempt the quiz is given in Fig. 7 along with the instructions.

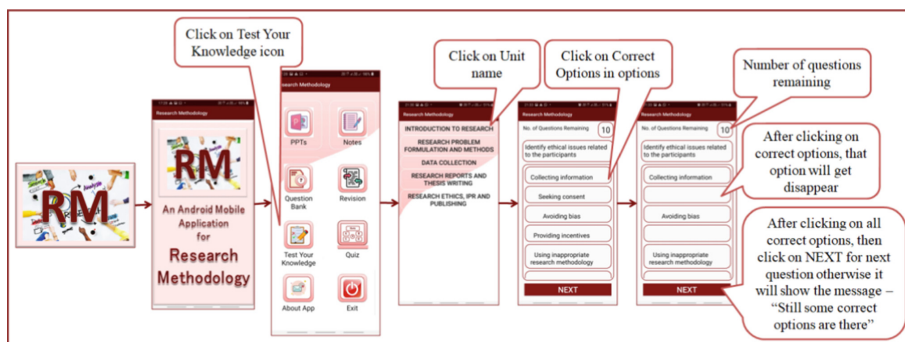


Fig. 6. Steps to attempt 'Test Your Knowledge'

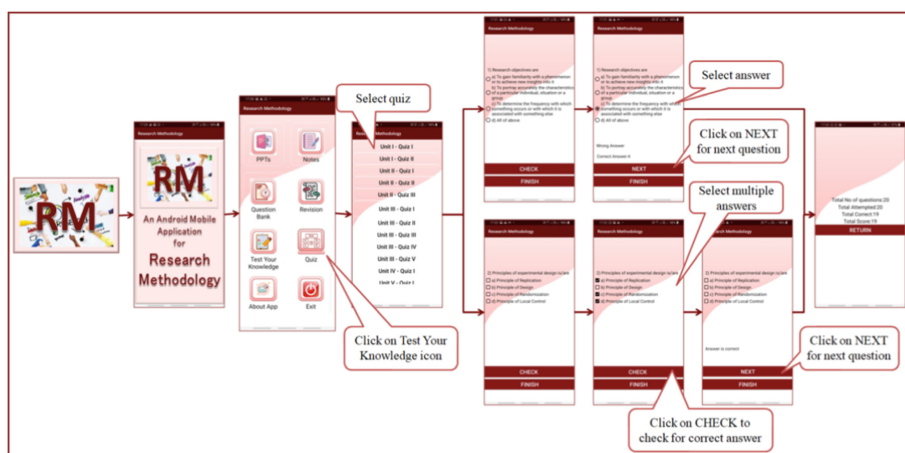


Fig. 7. Steps to attempt the quiz

3.7 About App

About App part of this mobile application contains the information about.

- Developer with details
- Course Objectives
- This app
- Syllabus and
- References

Whenever the new students/ learners download this app, then first step is to go through this 'About App' to know the details. Figure 8 shows the steps to go to this part.



Fig. 8. Steps to go through About App

Table 4. Comparison of new edition of app with previous one

Sr. No.	Previous app	New addition
1	PPTs for each unit	PPTs for each unit
2	Notes for each unit	Notes for each unit
3	Question Bank for each unit	Question Bank for each unit <ul style="list-style-type: none"> • Theory Question Bank • Multiple Choice Question Bank
4	-	Revision for each unit
5	Test Your Knowledge for each unit	Test Your Knowledge for each unit
6	-	Quiz based on each unit
7	About app	About app

4 Comparison with Previous App and Feedback

The Comparison of new edition of app with previous one is given in the Table 3. As in Table 3, two new addition, the Revision for each unit and Quiz based on each unit are added in the new version of this app.

The indirect assessment tool like survey questionnaire with Likert's scale of five values (strongly agree (SA), agree (A), neutral (N), disagree (D) and strongly disagree (SD)) is used to know the perception of research scholar about this mobile app. The

feedback is shown in Table 4. From table, it is observed that 100% students also like this mobile application for the course Research Methodology.

From the feedback, it is observed that an android mobile app RM engage the learners and help them to understand the topics of this course by practicing the quiz and testing the knowledge through Test Your Knowledge section of this app.

5 Methodology

To check the effective use of this app, this app was uploaded on the Google Playstore and PhD research scholar were asked to download this app from the link <https://play.google.com/store/apps/details?id=in.smd.rmversion>. After downloading the app, research scholar were asked to go through the PPTs, Notes, Revision, Quiz and Test Your Knowledge part of this app to understand the RM course. Test was conducted on all units of this course and statistical analysis was done based on the marks received by the research scholars. The question covered in the test was at Recall, Understand and Apply level of Cognitive Domain of Bloom's Taxonomy (Fig. 9).

6 Result Analysis

Figure 10 presents the marks obtained by 45 research scholars in test conducted which covered all units of the course Research Methodology.

Table 5. Feedback Form

Sr. No.		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	Whether RM app covers the syllabus of Research Methodology Course?	82%	18%	-	-	-
2	Whether power point presentations given in the app is useful?	78%	22%	-	-	-
3	Whether power point presentations of each unit of this app engage the students in learning the contents?	78%	20%	2%		

(continued)

Table 5. *(continued)*

Sr. No.		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
4	Whether notes for each unit given in the app are useful?	58%	42%	-	-	-
5	Whether theory question bank given in the app is useful?	64%	36%	-	-	-
6	Whether multiple choice question bank for each unit given in the app is useful?	82%	18%	-		
7	Whether revision part given the app for each unit is helpful to revise the content of this course?	78%	22%	-	-	-
8	Whether questions contained in 'Test Your knowledge' of the app engage the students in learning?	54%	46%	-		
9	Whether the quiz containing single correct answer or multiple correct answers for each unit is useful?	78%	22%	-		
10	Whether this app clarifies the concepts of Research Methodology?	66%	34%	-	-	-
11	Did you like this mobile app?	100%				



Fig. 9. Research Design

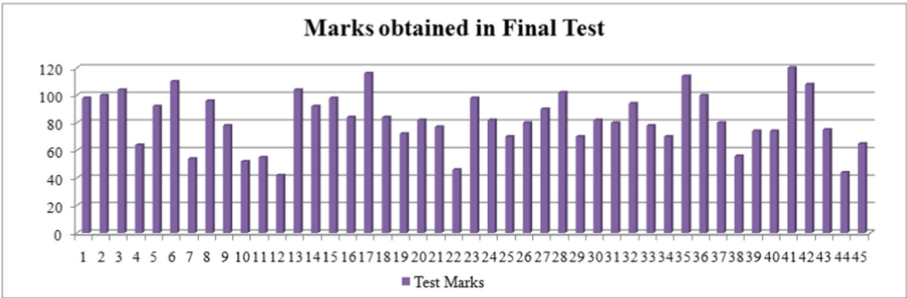


Fig. 10. Result of the test conducted covering all units

Table 6. Statistical Analysis

	Population Mean	t-value	p-value
Final Test (120)	76	2.150475	0.018526

Statistical analysis of marks obtained by students is done using t-Test analysis. Table 5 presents the statistical analysis of marks using t-Test. It is noted from Table 5 that there is significant improvement in the performance of students as p-value is 0.0294 which is less than 0.05 (Table 6).

7 Conclusions and Future Work

In this paper, the new version of the mobile app for the course Research Methodology after making the changes as per students' requirement in the previous version is considered. From the feedback given in the Table 4, 100% students agreed that the revision part added in the part is very useful to revise the content of the course. Also 100% students liked the quiz part containing single choice or multiple choice questions in the new version for practice. Very soon, this app will be made available for all the learners on Google Play Store.

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