Enhancing Learning Performance of Students in Higher Education with Adaptive Navigation Support

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Abstract. The study work on the development of a system prototype to aid the students in managing their assignments. The prototype employs Adaptive Navigation Support as an approach in providing personalized recommendation for the quiz that students must work on. With this prototype, the students can manage their quizzes better and complete more quizzes. In addition, the students are able to monitor their progress as well as their performance in particular course. Prototyping methodology was used to develop the prototype in mobile environment.

1. Introduction
There is a requirement for improving the present e-learning framework with the goal that it tends to be increasingly important to students [1]. This is as a consequence of the significant increase of learning material available on the internet with which students need to filter these materials and select the most appropriate one [2]. In such manner, a few methodologies were created, for example adaptive learning, open student model, and adaptive learning. Portable learning can be characterized essentially as the utilization of cell phones in a learning domain [3]. Open Learner Model is a worldview of learning exercises where students are uncovered with their learning model [4]. Learning model includes the essential data about students [5].

Adaptive learning system is an application that oblige student’s trademark as a reason for its association with the students. These qualities could be identified with both learning procedure and human elements. The previous is identified with students’ learning objectives, inclinations, information [6] while the latter consists of gender, prior knowledge, and cognitive styles [7]. Among these methodology, adaptive learning is one of the promising option as the quantity of students are expanded just as their heterogeneity [8]. Adaptive learning could be executed on different learning exercises identified with the courses and assignments.

One of the techniques in adaptive learning is adaptive navigation support. The main goal of adaptive navigation support is to provide students a system which can adapt to their goals, knowledge and characteristics [9, 10]. It was adopted in several area including website [11], mobile apps [12, 13], virtual guidance (CAULS) [13], e-learning [14–16], students’ registration process [17], quiz or assignment system [18]. To adopt adaptive navigation support approach, there are several factors affecting the process. One should consider the technology that will be used to implement adaptive navigation support and analyses the empirical environment in which the system will be used [10]. In addition, one should consider the domain of the user to elicit the requirements of the user [19]. While there are many works has been done in developing adaptive
navigation support system, only few of them that discuss about the evaluation regarding to user acceptance in a particular environment [10]. Based on previous research, the adaptive system will make students more engaged to the learning activities [20].

This paper expects to receive adaptive learning in test assignments since it is among the most significant piece of the course to evaluate the student’s exhibition. In this investigation, the Adaptive Navigation Support was being utilized as a primary method to build up an adaptive framework that can assist students with finishing all their task inside the course. With this sort of framework, understudy can screen their everything the tests that required to be done. In this manner, they won’t be missed the tests. Thusly, it will build their commitment to the course and improve their learning execution.

This paper comprises of four segments. Area two depicts the writing audit of the rising examination in ANS. Segment three clarifies the technique that have been utilized in this investigation. Area four portray the outcomes. Areas five will closes this paper with end and future works.

2. Methodology
The investigation was led in college and utilize the material from the course of Software Engineering. This course will show the students an information about programming advancement. To pass this course, a student should take a shot at 11 course materials and 22 tests. All the course material is as of now accessible ahead of time of the course beginning date. Before all else, students can begin the course from the main material and test. From that point onward, they can decide to proceed on any material or tests accessible from them dependent on their learning execution (students’ model).

The application will create on adaptive stage to be increasingly drawn in with the students as the fundamental client of cell phones. In addition, cell phones are progressively embraced to upgrade learning framework [21]. The prototyping approach were used to develop the system. In this method, there is a cycle which comprises five steps to follow, i.e. quick plan, modelling, construction, deployment and feedback, and communication [22].

2.1. System’s Flowchart

![Figure 1: Adaptation scheme](image)

As illustrated in Figure 1, the adaptive system consists of five components. The main component of the system is the user model, consisting of a database that stores the score
of quizzes that has been done by students. User model can record, evaluate, and provide feedback regarding to students’ performance [23]. The subsequent part is a adaptive motor. Its fundamental undertaking is to ascertain the students’ score and update the client models dependent on the consequences of the test. Likewise, the adaptive motor additionally can recover the present client model from the database to be utilized in the collaboration with the students. The framework will show tests dependent on client models sent by adaptive motor. After the test is finished, the framework will show the outcomes and send it to the adaptive motor. There are a few strategies that basic to be utilized in adaptive navigation support, for example, direct guidance, sorting, hiding, annotation [6,9,10,24]. Direct guidance is a method to provide the most relevant link to user at one time with a certain information [6]. Sorting is method to arrange the links or navigation in particular order based on user model [3]. Hiding is a method to show only the most relevant link to user while hide the rest [4]. Annotation is a method to add some code or graphic representation after the link that provide the user an additional information about the link [6]. In this research, the adaptive annotation was used.

2.2. User Modelling
To adjust with the understudy’s present execution, the framework depends on the client model. Client model speaks to the attributes of every understudy. In this investigation, it mirrors the capacity of the students to finish the tests. So as to keep up the exactness, the model ought to be refreshed consistently every time the students doing their tests. There are three stages to refresh the model [25] as depicts in Figure 2. At first, the framework will recover the consequence of the test. Besides, the score will be changed over to information level which speaks to the normal of score. At last, the information level will be mapped into execution score involves four classifications speaks to feeble to solid scholastic degree of the students. This score will be utilized as a reason for the framework to adjust with the client’s exhibition.

3. Results
The interface of the framework comprises of three principle highlights. To begin with, showing every one of the subjects inside the course. Second, showing the test. Third, showing all the outcome alongside its comment mirrors the students’ exhibition. In Figure 3a, framework will show thumbnail from all subjects of the course. At the point when students select on specific theme, it will show the test accessible for that subject as portrays in Figure 3b. Students would then be able to choose a test and answer the inquiries inside the test. The appropriate response will be spared to the database. Students can screen their present execution or information level in Figure 3c. It shows the all tests alongside its present score. There are three catch to enable the students to explore through their assignments, for example "Prepared" that will show all the tests that accessible for the students, "Therapeutic" that will show all the tests that has been done however need to re-survey in light of the fact that the score was low, and "Incomplete" that will show all the tests that not completed at this point. Also, the framework will contrast the students’ present execution and the standard score that they should accomplish.
3.1. Evaluation
The assessment of the application has been done through blackbox testing. There are a few situations to recognize whether the highlights produce the outcome true to form. The aftereffect of blackbox testing is portrayed in Table 1. While there are three situations is neglected to finish the assessment (ET-07, ET-08, and ET-11), the fundamental target of adaptive framework is as yet achieved since it can comment on the test result with various shading dependent on students’ presentation (ET-09).

| Code  | Scenario                                      | Result    |
|-------|-----------------------------------------------|-----------|
| ET-01 | Show the the course topics                    | Valid     |
| ET-02 | Show the material in particular topic         | Valid     |
| ET-03 | Display all the quizzes                       | Valid     |
| ET-04 | Complete the assignments                      | Valid     |
| ET-05 | Reserve the answer                            | Valid     |
| ET-06 | Collecting the answer                         | Valid     |
| ET-07 | Work on remedial                              | Not Valid |
| ET-08 | List the quiz category                        | Not Valid |
| ET-09 | Represent student’s performance with different color | Valid |
| ET-10 | Show the learning progress                    | Valid     |
| ET-11 | Show the overall achievement                  | Not Valid |

4. Conclusion
The adaptive navigation support is a component to customize the route show of the framework with the goal that it fit to the students’ needs. In light of the plan of model of the self administration test framework in this examination, the framework can assist students with choosing the most suitable test to be done dependent on their past works. There are three
choices of test that students can pick. It improves the students in arranging their test assignments as far as: they can focus on each test in turn which thus will improve their general learning execution. There are a few further works that should be possible later on. Despite the fact that the framework has been structured and created dependent on the client’s prerequisites, an assessment is as yet required so as to analyse the adequacy of the framework. In addition, the acknowledgment level of the framework among students ought to be uncovered.

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