MOBILE LEARNING SYSTEM FOR EVALUATING ENGLISH STUDY COURSE BASED ON AHP TECHNIQUE

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STATEMENT OF ORIGINALITY

I hereby certify that the work embodied in this thesis is the result of original research and has not been submitted for a higher degree to any other University or Institution.

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ABSTRACT

Nowadays, mobile technology that is increasing accessibility and affectability, and mobile devices show an essential part in the field of learning, entertainment and communication. Mobile devices have the potential in the improvement of education area and learning. Mobile learning application has become the fast development which means all activities that were conducted by using mobile devices. It had been widely used in education. One of the educational purposes is mobile applications that can be used learning English subject. In addition to education, mobile applications are developing as well as business, social media communication and transportation. Most evaluation system for mobile applications is choosing the criteria and alternatives of the hierarchal level. But some users are confused to evaluate the mobile application. In this situation, Decision Support Systems are the specialized class of computerized information system that supports business and organizational decision making activities. In the proposed system, Analytical Hierarchy Process is used to evaluate the educational mobile application and applied to make a decision in selecting for the most appropriate part of English subject. The main purpose of the proposed system is to improve English skills of students by using English Learning application. The administrator updates the new course and then the students study and practise the English subject for reading, listening and grammar.

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CHAPTER 1

INTRODUCTION

Traditionally, the education has been presented in courses anywhere students can join directly with their teachers, making students' physical occurrence very important. Nevertheless, the widespread concern of computers and communication machineries has prepared the learning process easier. Since the appearance of mobile phones in the 1980s, they have been generally used by people about the earth. It can think that the entire earth is suitable mobile; mobile phones are either communication tools, or portable and individual parts of technical material [16]. Mobile techniques are suitable improving everywhere. Such machineries can be used productively in different zones. By mobile technologies in education is a perfect example of modernization.

Many applications have been extended for mobile platforms. In the previous years, the applications had the target both educational attention, and marketing or business campaigns. Learning between mobile phones is called mobile learning or M-Learning that has developed component of the educational field. This M-learning is the specialized type of E-learning which contributes educative tools between mobile phones [14]. The aim of this study is to contact the education tools, cooperate within abilities and observe additional associated documents with other abilities, by android based mobile phones inside and outside the lecture room. It will too define the previous information of the user on the individual and instructive usage, and application of mobile device [1]. Many mobile applications have been proposed for educational purposes. Internet sites, for example, Android Apps at Google Play Store displays the type of learning applications for issues such as distinct languages; concepts connected to programming languages or mathematics. Our aim is to do a suitable way to take forward all the required components to a student who learns English Language. So, M-Learning will confirm the range of learning to each link of the institute against of any barriers [4].

In current years, the impressive improvement of data and communication technology (ICT) and wireless internet systems bring to the distribution of powerful mobile devices and the expansion of social and interactive communication tools.

Accordingly, an original form of learning is become, namely m-learning, and is widely spread in many educational contexts. Likewise, this new technology-enhanced learning trend was adopted in the area of Mobile learning and teaching, which provided learners with anytime and anywhere learning environment, became important trends in language teaching and learning [9].

This thesis demonstrates the usage of Analytical Hierarchy Process as structured method such decision making in mobile application. Evaluation the session of the mobile application is the multi-criteria decision making issue which wants to be accessed accurately attractive into attention the relative weights of the criteria for every user. The repeated multi criteria problem such as the hierarchy of decisions to be resolved using the Analytical Hierarchy Process (AHP) [11]. The common evaluation approach has particular achieved results by AHP model to assess a part of existing session in English Language Learning system.

AHP method is a branch of multiple criteria decision making (MCDM). Many approaches had applied for rank ascending that can be created in the information on MCDM [13]. However, AHP has developed more distinct for the following criteria:

1. AHP develops a chance for an abundant requirement of the decision makers in the accessing process.
2. The appearance of some commercial computer codes prepares the instrument understandable than some of MCDM techniques.
3. It is more generally distribute in managing workshops and textbooks (Render and Stair).

Dyer looks at AHP as an arbitrary process for ranking alternatives Dyer declares that "the key to the proper use of the AHP relies on its synthesis with the concept of multi-attribute utility theory." AHP is based on pairwise comparison where the relative significance of different attributes and also depends on the set of elements included in the comparison. AHP controls the Management Science information on decision support applications though Dyer and other efficiency concept deals the one of theoretically approaches [5]. However, Lugassietal find AHP more applicable than the efficiency method that is chosen by Dyer had improved the obvious foundations, but is impracticable.

1.1 Motivation

In the English learning system, the students can try to use a mobile phone as a learning tool and the instructors can also try to use it as a teaching tool. After the students use the learning application, the student must check to agree or disagree the lessons. The students must enter input data to calculate AHP technique and compare the criteria for decision making process. Therefore, the students can do English Language exercises easily in mobile application and AHP methodology can be applied to make a decision in selecting for the most appropriate part of learning English subject.

1.2 Objectives of the System

The objectives of the system are to enhance English skills of students by using English Learning application in education. The students study the lesson and practise the exercise anywhere and anytime. The administrator looks at the scores that students exercise. And then the administrator adds to improve the new courses for students performance.

1.3 Overview of the System

Analytic Hierarchy Process rank scales elements and integrates both objective (e.g.; quantitative) and subjective (e.g.; qualitative) calculations into combining hierarchical structure. Built on their criteria, this estimation is computed over the pair-wise comparison of the elements of the system. The process is defined into four parts:

1. To structure a hierarchy of decision maker's criteria and elements
2. To collect input information using pair wise comparison
3. To use the reciprocal method to produce priorities for the criteria
4. To synthesize the priorities into combined processes to reach at a set of ratings for the elements of the method.

In this study, the users are going to learn each session of the English Learning system. The four criteria used for calculating every session are

1. Easy to Understand

2. Effective

3. Convenience

4. Flexible

Analytical Hierarchy Process (AHP) requires pair-wise comparisons of entities. Normally, such pair-wise comparison is a high weight in management frameworks, and then they are created to be suitable where the competitions occur between pairs of lessons. The adaptability of AHP is realized by the way a problem might be disintegrated into hierarchical stages. In this study, the higher level of the hierarchical process comprises the criteria which provide to the value of each language session (three to five criteria). The lower level of the hierarchical process comprises components for evaluation (reading, listening and grammar).

After completing the hierarchal model, the user accumulated input information that would start the relative significance weights (priorities) for every set of elements at every level of the hierarchical process collected [5]. The input data for the application consists of matrix of pair-wise comparisons of components at a lower level, which provides to accomplish the purposes of the next higher level.

The purpose of the existing analysis is to duplicate Sinuany-Stern's results [2] and more range the effectiveness of the AHP method for calculating lessons and forecasting their presentation in education.

1.4 Organization of the Thesis

This thesis is organized into five chapters. Chapter 1 introduces about the system. Chapter 2 explains the theoretical background of decision support system. Chapter 3 presents Analytical Hierarchy Process and basic concepts of Multi Criteria Decision Making (MCDM) methods. Chapter 4 describes design of the proposed system, and implementation of proposed system. The last chapter explains the conclusion, benefits, and further extensions of thesis.

CHAPTER 2
THEORETICAL BACKGROUND

2.1. Decision Support System (DSS)

Decision support system is associated, computer-based systems that provide users in judgments and special activities. Data storage and recovery functions are provided. They provide farming, demonstrating and problem resolving. Characteristic of DSSs is managing and planning in commercial, health care and any field where management will meet composite decision conditions [12]. It is usually operated for planned decisions made by higher level managing, decisions with practically small rate and high possible significances, where the time taken for thoughtful and creating the problem supports liberally in the extended run [6]. Database Management Systems are one of the fundamental components of DSSs. Decision support system is information system that provides users to create a decision by supplying models, analysis tools, and information. A model is a representation of various part of the real world.

One of the purposes of the development of information systems is to provide in decision making. Decision support system has been developed to support the decision making procedure [12]. They interactively assist a decision maker in proposing analytic prototypes and entry to the database. In the part of application, a structure should provide its user a way to use models and database in a cooperative term.

Decision support systems are the specialized class of computerized information system which supports business and organizational decision making activities. A perfectly created DSS is a cooperative software-based system intended to identify decision makers that compile suitable information from personal knowledge, documents, and/or business prototypes to define and resolve problems, and create decisions [9].

Usual information that a decision support application might collect and introduce:

1. The user's catalog existing information effects (containing legacy and relative data sources, dices, data warehouses, and data marts),

2. Correlative figures between one week and the next,

3. Predictable income figures built on new product sales expectations,

4. The significances of distinct decision alternatives, agreed past knowledge in a situation that is defined.
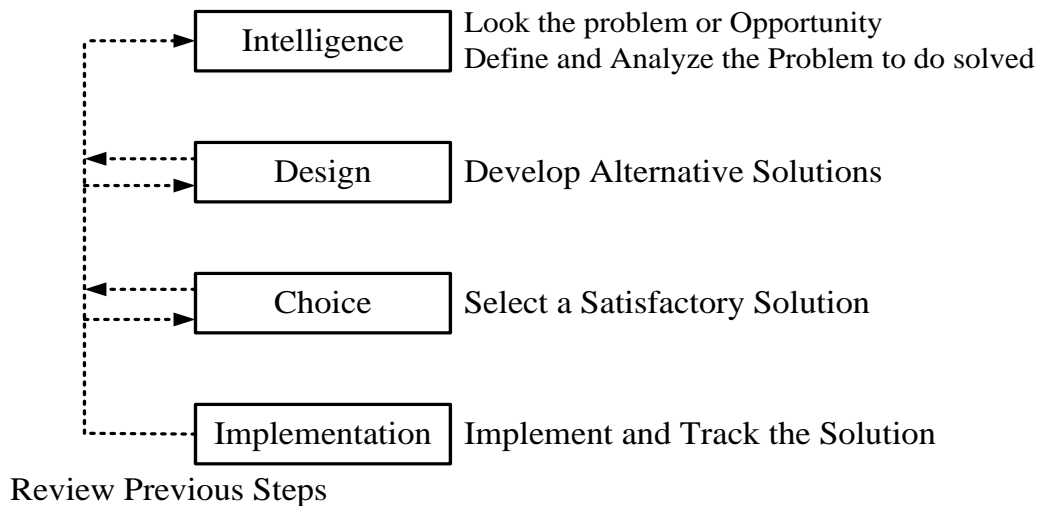
Figure 2.1 The Decision Making Process

DSSs support various stages of decision-making process. The general decision-making process consists for four steps. During the first step, known as intelligence, a search of the environment is made to find and define the problem or an opportunity [12]. During the next step, called design, several alternative solutions are developed, to be compared to one another during the following stage of "choice". The solution is then implemented and tracked, in order to be improved upon in Figure 2.1.

2.2 The Purpose of Decision Support System

The purpose of decision support system is to provide managerial decision making. This support may come about indirectly through staff operation of the DSS or as a result of hands – on use by management [12]. The DSS developed may require a new organization unit with a position within the organization's structure, requiring relationships with other organizational units and submitting them to the administrative control of management.

The actual operation of a DSS may require skills that are not possessed by many managers. In these cases, an intermediary may operate the system for the user.

The purpose of DSS is to provide a manager in the decision making procedure by supplying needed information [6].

A decision method has large influence on the incomes of the many applications. It makes the management to explain the devaluation, catalog and expansion polices [11]. It notices the management against nearing calamities and difficulties in the presentation. It especially supports the following fields:

1. The management realizes accurately how much recognition it can accept, for the decision making process and interest rate. It has been proven that if there is no proper feedback, managers tend to take too much credit and burden the cash flow of their companies.

2. A decision method permits for attentive financial design and tax planning. Currency flows are continued positive throughout and incomes ascend, non-cash expenses are maintained, tax accountabilities are diminished.

3. The final result by using beyond effects, the rate of the enterprise develops and its shares improve.

4. The decision method is an essential part of financial management. It is totally suited with western computing methodology and arises all the data which it needs from information existing in the corporation.

Thus, the foundations of a decision method do not delay the operating of the application at all and do not constrain with the specialist and operating of the financial division [12].

2.3 Decision Support System Technology

The three parts of decision support system technology have been identified.

1. Specific Decision Support System
2. Decision Support System Generators
3. Decision Support System Tools

2.3.1 Specific Decision Support System

It is the definite application which the manager creates between the decision processes. It is established with the usage of DSS tools or generators. A variation of specific DSS is present in the software forum [11]. Nevertheless, they

have to be modified to the reality environment where they will be used. DSS usually undertakes predictable to develop as time permissions.

2.3.2 Decision Support System Generators

It is a software package that supports abilities for constructing specific DSSs quickly and simply [9]. Abilities of generators differ extensively. The corporate feature is much of making and data processing systematically required in a specific DSS does not need much programming.

2.3.3 Decision Support System Tools

A variation of tools might be worked as constructing blocks to establish the specific DSS and the DSS generator. These tools contain programming languages with great abilities for retrieving collections of data (for example, APL), simple program combinations, arithmetical combinations and DBMS with an inquiry ability [15].

2.4 Developing the Decision Support Systems

DSS is a cooperative of abilities that provide the decision making procedure of a definite individual or comparatively limited group of people. There are three general approaches to building DSSs [11].

2.4.1 The Quick-Hit Approach

It is the way of the greatest DSSs that produce rates. Most DSSs are constructed for the personal usage of a decision marker [17]. DSS is made not only by the manager but also by the constructors who involve an additional or fewer recognized DSS group.

2.4.2 Traditional Life-Cycle Development

This approach initiates with complete system development and analysis, progress concluded the design phases subsequently testing and coding, and proceed to implementation. The procedure is long, and there is a complete structure to effort the system after the system is finally work done [14]. The development method is

appropriate for composite application; in specific effect by any workers and wherein informative conditions can be worked initial through the analysis procedure. It is certainly the situation when a DSS generator is to be constructed. An actual great model-based organizational DSS that influences a quantity of practical elements or business processes in an association may be constructed by a life-cycle method [17].

2.4.3 Iterative Development

It depends on making of a model and its advanced improvement. The process starts when the coming consumer and the DSS constructor jointly define problem to be solved and then discuss the application [17]. To establish the actual DSS, all three of the elements (database, model and dialog) will accept to be constructed with the usage of abilities presented by the DSS generator or with DSS tools.

2.5 Classification of DSS

The classification of DSS yields the whole range of applications, reaching from the entirely data-oriented to the more effective model-oriented systems [20]. DSS often maintains the mix of these capabilities.

2.5.1 Data Access Systems

This system supports accessible ad hoc access to the database. Its ability is equal to what exists by most DBMSs complete a query language. But, each system "opens up" the database [14]. They are mostly association to make workshop floor persons to frequently display the floor or a specific piece of machines; so these DSSs help in controlling operations.

2.5.2 Data Analysis Systems

This analysis system supports to examine historic and existing data either demands on ad hoc or at times. The transport method helps a system of this type to contrast its presentation with that of its participants [19]. The database of the system comprises the documents on the periodical presentations of all transports, agreed to the Civil Aeronautics Board of the centralized government. This system is regularly concerned with the association of data, for instance compiling the performances of a

corporation's sub-units and awarding the précises in charts. Simply prototypes are worked in this system.

2.5.3 Forecast Oriented Data Analysis Systems

The systems usually help in increasing product plans, containing advertise section predictions, sales predictions, and evaluates of aggressive activities [19]. The process is built on entrance to a variation of external and internal advertising and produce databases, comprising sequence of the variety of historic data [13]. The system in this type contains only the understandable of the variability of advertising reproductions, which display how current developments in the market will extends in the future if related conditions overcome.

2.5.4 Systems Based on Accounting Models

DSS is used to recognize alternatives option for development purposes, built on computing explanations and associations [9]. Such systems usually create predictable revenue declarations, balance sheets, or other measures of financial presentation. The "what-it" style of process is normally working to relate alternatives.

2.5.5 Systems Based on Representational Models

The systems invade usage of ready standard formulas, for instance those working in systems that depend on book-keeping models. Relatively, representative models display the dependency between a manageable variable, such as the value of a creation, and result, such as transactions. These are normally reproduction models which produce probable outcomes [14].

2.5.6 Systems Based on Optimization Models

It is established by manageable inventors to define best resources allocation or best probable timetables. By the methods of linear programming, the individual can create the mixture of goods that must be manufactured to capitalize on an independent for example income, issue to a variability of restrictions [6].

2.5.7 Systems Based on Suggestion Models

This system "push the envelope" of decision support system by essentially suggestive of results, instead of simply replying to the invitation of the consumer to calculate an alternative [14]. Classifications with suggestive models submit solution in fine dominions of information and occasionally associate a DSS with an adept system. Such a model may advise the rate, the rate of assurance regeneration, or production size.

2.6 Characteristics of Decision Support System

The characteristics of DSS are as follows:

1. **Semi-Structured Decision**: DSS supports decision markers generally in semi-structured and formless conditions by taking together personal experience and computerized evidence [11].

2. **Interdependent or Sequential Decisions**: DSS also provides for various individualistic and successive results.

3. **Support Intelligence, Design and Choice**: DSS provides all the stages of result creation that is aptitude, project, optimal and execution.

4. **Support Variety of Decision Styles and Processes**: DSS provides a variation of management process and approaches.

5. **Adaptability and Flexibility**: DSS is adaptable above times. The decision maker can interact to the decision made from computer support system and is able to cash the conditions very soon and with flexibility [11]. DSS is flexibility enough so that the user can add, delete, combine, change and rearrange basic elements.

6. **Simplicity of Use**: DSS is very simple to use. The users feel easily with the applications when they are working. User friendliness, flexibility, strong graphic capabilities and an English-like human-machine interface language greatly increase the effectiveness of DSS [12].

7. **Effectiveness not Efficiency**: DSS's working principle always tries to develop the effectiveness of decision making not the efficiency. Though an effective decision leads to efficiency.

8. **Humans Control over the Machines**: The decision marker has comprehensive mechanism over all steps of the decision making process in solving any problem.

A DSS aims to support not to replace the decision maker [6]. The decision maker can override the computer's recommendation any time in the process.

9. **Evolutionary Usage**: DSS brings to information that further brings to original orders and the improvement of the applications that in turn starts to supplementary information and so on, in a continued process of making and developing the DSS.

10. **Ease of Construction**: End-consumer is capable to establish understandable structures by themselves. More application could be made by a group of users in the organization by the help of information system specialist [12].

11. **Modeling**: A DSS generally operates models for examining result states [11]. The modeling ability allows investigating with distinct approaches in different conformations. The experimentations can support original views and information.

12. **Knowledge**: Advanced DSS is equipped with information that allows the effective and efficient resolution of very hard difficulties.

2.7 Components of Decision Support System

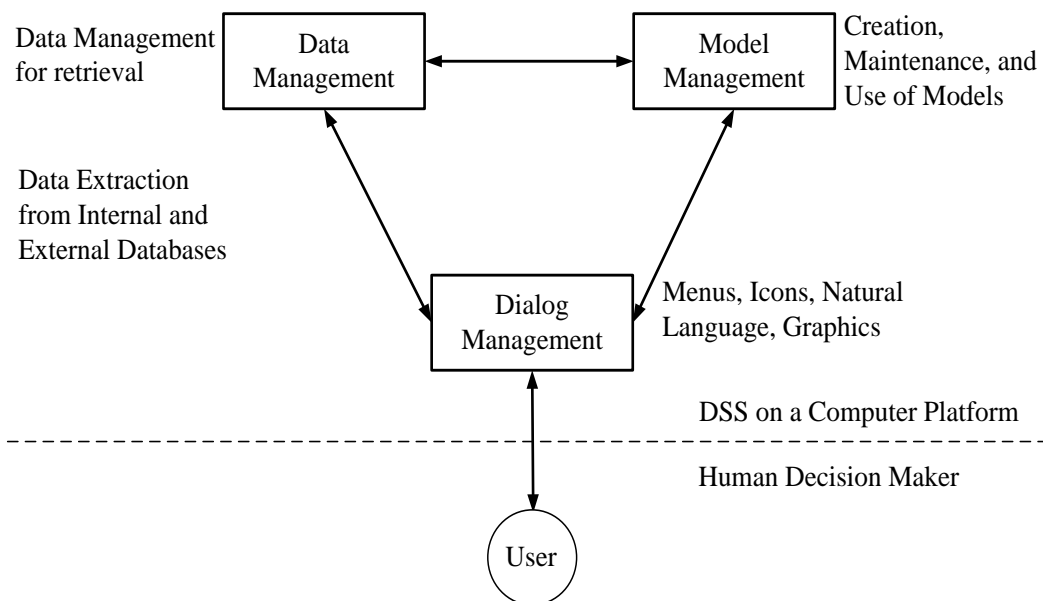There are three essential components of DSSs in Figure 2.2.

Figure 2.2 Components of Decision Support System

The benefits of Decision Support System are to develop particular effectiveness, to facilitate interpersonal communication, to improve training or

learning, to maintain governmental mechanism, to produce different suggestion in support of a decision, to make an aggressive advantage over contention and to inspire investigation and detection on the component of the decision marker [13].

2.7.1 Data-Base Management Subsystem (DBMS)

It creates as a data store for the DSS. It maintains large amounts of data which are accessed to the course of complications for which the DSS has considered and supported consistent data arrangements (for example opposite to the physical data arrangements) by which the end user interacts. DBMSs split consumers from the tangible features of the catalog construction and processing. It must too be useable of notifying the consumer of the types of information which are easily accessible and how to advance admission to them [15].

2.7.2 Model-Base Management Subsystem (MBMS)

The role of MBMS is equivalent to that of a DBMS. Its main utility is supporting individuality between definite prototypes that are used in a DSS from the productions that practice them [15]. The aim of an MBMS is to modify documents from the DBMS into data that is convenient in decision making. Then the several issues which the user of a DSS manages with may be unorganized, the MBMS must too be able of supporting the user in model construction.

2.7.3 Dialog Generation and Management Subsystem (DGMS)

The main production of collaboration with a DSS is vision. By way of managers who are not computer-trained, DSSs want to be appointed with instinctive and simple boundaries. These boundaries help in prototypical structure, but also in communication with the model, for instance achievement vision and commendations from it [15]. The main responsibility of a DGMS is to improve the capability of the user to use and help from the DSS. In the remaining object, the user practises the more period user boundary before DGMS.

CHAPTER 3

ANALYTICAL HIERARCHY PROCESS (AHP)

3.1 Multi-Criteria Decision Making

MCDM is a methodology which supports decision makers created preference decision (e.g. judgment, ranking, selection) based on a definite set of existing alternatives (courses of action), described by multiple, possibly disagreeing attributes [13]. MCDM offers a formal framework for creating multi-attribute decision problems, principally those that demand a methodical analysis, containing an examination of the decision complication, the consistency, the important significances, and the essential for responsibility.

Among the well-known methods, the MCDM is recently employed to evaluate organizational presentation. MCDM practices a set of attributes to explain a decision problem. These features are normally neglected by many decision making systems then they are indicated by quantitative variable [10]. But, quantitative features can be directly important, otherwise essential than the measurable features. For the reason, it is flawless that the user requires a methodical and complete approach to decision making anywhere both measurable variables can be involved in the evaluation.

3.2 Approaches to Multi-criteria Decision Making

There are three ways to solve multi criteria decision problem. They are:
1. Goal Programming
2. Scoring Models
3. Analytical Hierarchical Process

3.2.1 Goal Programming

Goal programming model is comparable to linear programming model but linear program has one design but goal program can have several designs. Goal programming, a division of multi-criteria decision making (MCDM), is a division of multi-objective optimization. It is a development program. It is supposed of an addition or explanation of linear programming to hold several, usually disagreeing objective methods [10]. Each method is specified a target or goal rate to be completed. Rejected

diversions from the target rate are reduced in an accomplishment task. It can be a weighted sum relying on the goal programming different used.

3.2.2 Scoring Models

A numerical formulation is applied to compute scores based on data, for example facts from the report of a customer. Scoring model defines specific collection tools within a total collection procedure agree to properly judge applicant quantifications. It establishes the method in which specific collection tools are counted [13].

3.2.3 Analytical Hierarchy Process (AHP)

AHP is established by Thomas Saaty defined the analytical hierarchy process for instance a decision making method based on the instinctive personal capability to create judgments about small problems. It is a structured procedure for dealing with complicated decisions. Reasonably determining a "correct" decision, AHP supports the decision markers detect the individual which agrees their requirements and their understanding of the problem [7]. AHP offers a complete and relative framework for constructing a decision problem, for signifying and measuring elements, for associating the elements to complete goals, and for calculating different explanations. It is used in a widespread variation of decision states, in areas for example education, business, healthcare, organization, and industry.

AHP is an effective and formative decision making process which is useful in the set significances and creating the good decision. By decreasing complicated decisions to a sequence of one-on-one comparisons, then synthesizing the greatest results, AHP not only supports decision markers, but also arranges an understandable explanation [6]. AHP is particularly acceptable for complicated decisions that contain the comparisons of decision elements which are hard to calculate. It is built on the acceptance when it met with a complicated decision the ordinary human response is to aggregate the decision elements according to the common appearances [8].

This is an approach to arrange requirements significantly. The approach can improve one's systematic thoughtful. Anyone who identifies simple calculation can recognize this process. It does not need any appropriate skill. By appropriately allowing significance to the requirements pairs, it is probable to arrange them [7]. This may

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support to prioritize the conflicting requests. This may support the developers to resolve which condition must be controlled principal in the restrictions of accessible resources, and period [11]. If the task is for the improvement of profitable product, at that time this system can support to design consecutive issue of a creation by classifying which requirements must be completed first, and which should be gone to sequential release.

AHP is one of the most expansively abused decision making systems in case when the result is built on some criteria (sub-criteria). Composite decision problem resolving, which this process procedures, is built on the problem disintegration into a hierarchical level which involves of the goal, the criteria, sub-criteria and the alternatives [6]. AHP is a calculation method for evaluating composite decision problems under multi-criteria. The manageable possibilities for a specific decision problem are considered by their qualities with respect to a set of complete criteria.

3.3 The Widely Applicable AHP

AHP is established by Thomas Saaty. AHP supplies an established, operative resource to deal with complex decision making and can help with recognizing and evaluating range of criteria, considering the data composed for the criteria and expending the decision making process. AHP should be used when constructing composite decisions including multi-criteria [12].

Any composite condition that needs establishing, analysis, and/or combination is a acceptable applicant for AHP. Nevertheless, AHP is infrequently used in separation. Relatively, it is used in maintenance of other methods. As to manufacture the effects of additional methods for example in determining how many servers to work in a queuing condition bringing into account waiting times, costs, and human preventions, or to originate possibilities for a decision tree. Wide parts where AHP has been effectively worked contain: collection of one different form many resource allocation; predicting; entire quality executive; business process reproduction; feature utility development, and the composed record [2].

3.4 Benefits of the Analytical Hierarchy Process

AHP supports abduction both individual and impartial calculation processes. A suitable machine for examination the consistency of the calculation processes and alternatives has been recommended by the group accordingly decreasing partiality in

decision making [7]. AHP allows the collective with gathering computerization; organizations can decrease general consequences of group decision making process, for example absence of attention, preparing contribution of possession, that eventually are inflated disruptions that can avoid groups from creating the correct choice [6].

3.5 The Usage of Analytical Hierarchy Process

The first stage is for the group to disintegrate the goal into its essential parts, continuing from the common to the definite [12]. In its understandable form, this structure includes a goal, criteria and alternative stages. Each set of alternatives would be separated into a suitable level of part. The more criteria are comprised in distinguishing the less significant each individual criterion may develop as shown in Figure (3.1).
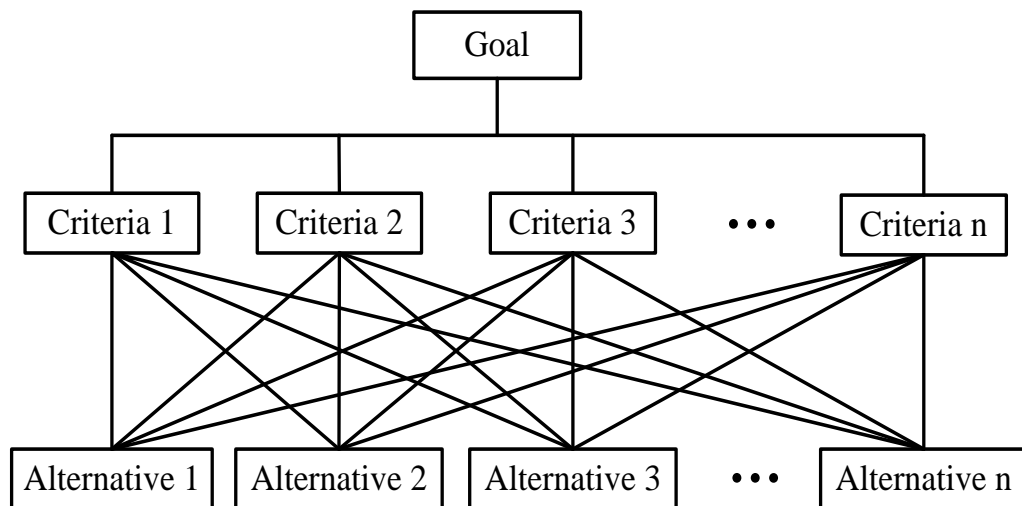

Figure 3.1 A Hierarchical Structure for AHP

Then, a comparative weight is assigned to individual. Each criterion has a local and global priority. The sum of all the criteria below a specified parental criterion in each level of the model must be equal one. Its global priority displays its qualified significance in the general model.

Lastly, afterward the criteria are rated and the information is composed, the information is placed into the model [7]. Although counting is on a comparative foundation, it is not a complete foundation, and it should be compared one excellent to another. Qualified rates for each excellent are calculated within each sheet of the hierarchical level. Rates are combined through the model, accommodating a complex rate for each excellent at each level, along with a general rate.

3.6 The Three Primary AHP Functions

AHP has been used in an extensive variation of applications – multiple impartial decisions making is being just one [16]. It wants to view at three primary functions of AHP – constructing complication, calculation, and separation that support in accepting how AHP is a common method with a widespread variability of applications

.

3.6.1 Structuring Complexity

Saaty thought an understandable way to achieve complexity. Understandable way is sufficient that establish persons with no proper preparation cloud appreciate and contribute. He found one object ordinary in many instances of the ways persons had distributed with complication over the ages – that was the classified constructing of complication into homogenous groups of issues. Saaty was not the principal to detect the significance of classified constructing in human belief [18].

3.6.2 Measurement on a Rational Scale

While previous decision making methods depended on lower stages of capacity (Electric by statistic capacity), Saaty's scientific exercise influenced him that ratio rates would most exactly amount the issues that included the hierarchical level [19]. This was not an original knowledge. Along with Steven' capacity classification structure, there are four levels of measurement.

The levels, extending from bottom to top are Nominal, Ordinal, Interval, and Ratio. Each level has all of the significance of the levels under plus added importance. For example, a ratio quantity has ratio, interval, ordinal, and nominal meaning. An interval measure does not have ratio importance, but does have interval, ordinal and nominal importance [18]. Ratio measure is needed to characterize quantity. While the proportions in Monet's painting, for example, are representation of the world as most persons display it, Picasso's images are beloved for their supposed infuriating qualities, but are bad model of the actual world.

In care with examine for as understandable a method as probable, Saaty suggested to use judgments of the ratios of each pair of features in the hierarchy to originate ratio rate processes. Any hierarchical structured method as AHP and Multiple Attribute Utility Theory (MAUT) must be used ratio range priorities for essentials above the lowest level of the hierarchical level. This is essential because priorities of the

components at any layer of the hierarchy are defined by increasing the priorities of the components in that layer by the priorities of the parent component. Then the creation of two interval stage calculates is statistically empty, ratio rates are essential for this reproduction [19].

However AHP also uses ratio rates for even the lowest stage of the hierarchical stage, MAUT uses an interval range for the alternatives. Therefore, the subsequent priorities for alternatives in an AHP model will ratio rate calculate. The ratio rate, being a higher level of analysis, is principally significant if the priorities are to be utilized either in special requests or for other kinds of requests for example resource allocation [18]. A complete discussion of the ratio rates established by AHP is offered in segment below.

3.6.3 Synthesis

Analytical, the principal term in the name of AHP is a method of the term examination, which determines splitting a component or intangible object into fundamental components [21]. Analysis is the reverse of synthesis that included placing together or joining parts into an entire. Subsequently complex, critical decision conditions, or predictions, or resource allocations often contain too several scopes for persons to manufacture automatically, it wants an approach to manufacture over several scopes. High level associated decisions consultations might have immorality leaders of economics, advertising, processes, information systems, and human resources meeting about a discussion table, each supplied with the effects of analyzes that their branches have accomplished. Each may too have got a distinct assumption as to what is greatest for the association [21].

The stalemate frequently is not a lack of good analyzes, but an absence of capability to synthesize the analysis which have been completed. Many sequences at Colleges explain examination of a category or another. Many governments have subdivisions or divisions with the term analysis [20]. It can be spoken of financial investigation, promotion investigation, tasks examination, and process investigation. Organizations have developed rather respectable at doing exploration. Few governments, nevertheless, identify how to synthesize. Though the hierarchical level of AHP does simplify analysis, an equal more significant task is the aptitude of AHP to support us

quantity and synthesizes the mass of elements in a hierarchical stage. It cannot identify any other method that simplifies combination as AHP [15].

3.7 Steps to Use Analytical Hierarchy Process

There are four stages of Analytic Hierarchy Process: decomposing, weighing, evaluating, and selecting.

3.7.1 Decomposing

The aim is to construct the problem into physically – controllable sub – problems. So, repeating from upper to lower divided the problem, which is unregulated at this stage, into sub – modules that will develop sub – hierarchies. Directing through the ranking from upper to lower, the AHP model includes goal, criteria, and alternative ratings [12].

Each division is then further separated into a suitable level of feature. At the end, the repetition method converts the unregulated problem into a controllable problem prepared both precipitously and straightly below the form of a hierarchical stage of criteria [6]. By aggregating the number of criteria, the significance of each criterion is so weakened that is rewarded by passing on a mass to each criterion.

3.7.2 Weighting

The user must allocate a comparative mass to each criterion, built on its significance within the module to which it goes. The sum of all the criteria going to a corporate direct parental criterion in the similar hierarchical level must equal 100% or 1. A global priority is calculated which measures the qualified significance of a criterion with the complete decision model [12].

3.7.3 Evaluating

The user must calculate replacements and associates each one to others. By AHP, a qualified rate for each replacement is allocated to each sheet within the hierarchical stage, and then to the division the sheet to, and so on, up to the upper of the hierarchical stage, where on complete rate is calculated [6].

3.7.4 Selecting

The user must associate replacements and choose the one that is applied the best requests [6].

3.8 Pair – Wise Comparison

A horizontal structure of facts in a matrix is called a row; a vertical one is called a column. A matrix containing of one column or one row is called a vector. A matrix is called a square matrix if it has an equivalent number of columns and rows. It is useful to note that associated with square matrix which is its Eigen vectors and corresponding Eigen values [5].

Table 3.1 Number of Comparison

Number of things	1	2	3	4	5	6	7	n
Number of comparisons	0	1	3	6	10	15	21	n (n-1)/2

The ascending is not required 1 to 9 but for significant data such as choice, rank and individual ideas. It is proposed to practise rate 1 to 9. Addition the decided upon quantity, reproducing the evaluation, in a matrix and discover the Eigen vector with the largest Eigen value [5]. The Eigen vector supports the significance order, and the Eigen value is a quantity of the reliability of the judgment.

3.8.1 Making Comparison Matrix

The comparison of power is continuously an activity performing in the column on the left across an activity performing in the row on top. Table 3.2 is pair – wise comparison matrix with five rows and five columns (a 5 x 5 matrix).

Table 3.2 Pair – Wise Comparison Matrix

Criteria	A	B	C	D	E
A	1	5	3	9	7
B	1/5	1	5	3	9
C	1/3	1/5	1	7	5
D	1/9	1/3	1/7	1	5
E	1/7	1/9	1/5	1/5	1

The diagonal elements of the matrix are constantly 1 and only want to rise up the upper triangular matrix [5]. The user must rise up the upper triangular matrix by the following rules:

1. If the result value is on the left side of 1, place the actual decision value.
2. If the result value is on the right side of 1, place reciprocal value.

The "agreed upon" facts are the following. Certain elements A and B, if A and B are equally important, insert 1. A is weakly more important than B, insert 3. A is weakly more important than B, insert 3. A is strongly more important than B, insert 5. A is demonstrably or very strongly more important than B, insert 7. A is absolutely or very strongly more important than B, insert 9 in the position (A, B) where the row of A meets the column of B.

An element is equally important when compared with itself, so where the row of A and column of A meet in position (A, A), insert 1. Thus, the main diagonal of a matrix consists of 1's. Insert the suitable reciprocal 1, 1/3, or 1/9 where the column of A meets the row of B, i.e., position (B, A) for the reverse comparison of B with A. To fulfill lower triangular matrix, use the reciprocal values of the upper diagonal. If a_{ij} is the element of row **i** and column **j** of the matrix, then the lower diagonal is filled using this reciprocal formula.

The matrix has reciprocal properties, which are shown in Equation 3.1.

$$a_{ij} = 1 \, / \, a_{ij} \qquad\qquad\qquad\qquad (3.1)$$

Where a_{ij} is the element of row **i** and column **j** of the matrix.

All the element in the comparison matrix are positive or $a_{ij} > 0$.

3.8.2 The Use of Arbitrary Scales

AHP is built on pair – wise comparisons wherever the comparative significance of distinct features is agreed a rate on scales of 1 to 9 or the reverse (1/9th to 1). These rates are in training allocated by unwritten derivation of result indicators [6]. For instance, if a person says attribute A is "moderately more important" than attribute B, A is said to have a qualified value of 3 times that of B while being "extremely more important" will give A is a weight of 9 times that of B. While this value is commonly used in AHP, it is arbitrary and substitute values have been suggested. Experiential

examination has created that the apparent sense of the unwritten terms differs from one issue to the following and also depends on the set of components involves in the comparison [12]. Nevertheless, these assistants touched the problem which was capable in that the rate could be built on experiential indication of AHP user opinions.

3.8.3 Rank Reversal

AHP, similar many structures built on pair–wise comparisons, can create "rank reversal" results. This is a condition where the procedure of favorite is, for instance, A, B, C then D. Then if C is reduced for added reasons, the procedure of A and B can be reversed so that the resulting priority is B, A, then D. It has been established that any pair – wise comparison method will still have rank reversal results whenever the pair favorite is regular. Opponents of AHP describe an important flaw while exponents have claimed both that (1) rank reversal in must occur in some states and that (2) where rank reversal is irrational it can be modified [12].

3.8.4 Priorities Vector

A comparison matrix has to calculate priority vector, this is regularized Eigen route of the matrix. Each column of reciprocal matrix is summed to become Eigen value. At that time, the matrix within the addition of each column is separated by each component to get regularized relative weight. The sum of each column is 1. The regularized major Eigen vector could be got by averaging across the rows. The regularized major Eigen vector is also called priority vector. Then this is regularized, the sum of all components inside priority vector is 1. The priority vector displays relation rates among the belongings which associate. Away from the relative rates, the consistency of the answer is checked. To do that, Primary Eigen value is needed. Primary Eigen value is got from the summary of products between each component of Eigen vector and the sum of columns of the reciprocal matrix. A priority vector is got when an Eigen vector is normalized. It can be realized that the calculation of priority vector is one [6].

3.8.5 Basic Principles of AHP

The principle of AHP relies on the pair – wise comparison [6]. Each pair of objectives is compared and ranked on the following scales. When objective i and

objective j are compared (where i is assumed to be at least as important as j), a value a_{ij} is given as follows:

Table 3.3 Pair – Wise Comparison Values

Values a_{ij}	Comparison description
1	Objective i and j are equal importance.
3	Objective i is <u>weakly</u> more important than j.
5	Objective i is <u>strongly</u> more important than j.
7	Objective i is <u>very strongly</u> more important than j.
9	Objective i is <u>absolutely</u> more important than j.

The Analytical Hierarchy Process is the concept of quantity through pairwise comparisons and depends on the decisions of experts to originate priority values. It is these values that measure indefinite in related terms [12]. The comparisons are complete using a value of complete decisions which represent how much more; one element controls another with respect to a specified attribute. The judgments may be unpredictable, and how to degree in consistency and develop the judgments, when probable to achieve improved reliability is related to the AHP [7]. The resulting priority values are manufactured by increasing them by the priority of their parent nodes and addition for all such nodes.

CHAPTER 4
DESIGN AND IMPLEMENTATION OF THE SYSTEM

4.1 System Flow Diagram of the Proposed System

The system is decision support system in mobile English Learning System by using AHP method. There are two main parts in this system, the first one is administration side and the second one is student side. The first one is the creating the mobile application for English Study course and the second one is to evaluate this mobile application using AHP model. Figure 4.1 explains the system flow of administrator for the application. There are three steps in admin side. The first one is to check the valid of the administrator. After validation, admin needs to choose which session they want to update the lessons. After choosing the lesson, the admin can insert, delete and update the lessons. The updated lessons are stored in the lesson database and are seen the lessons which are already updated from student side.
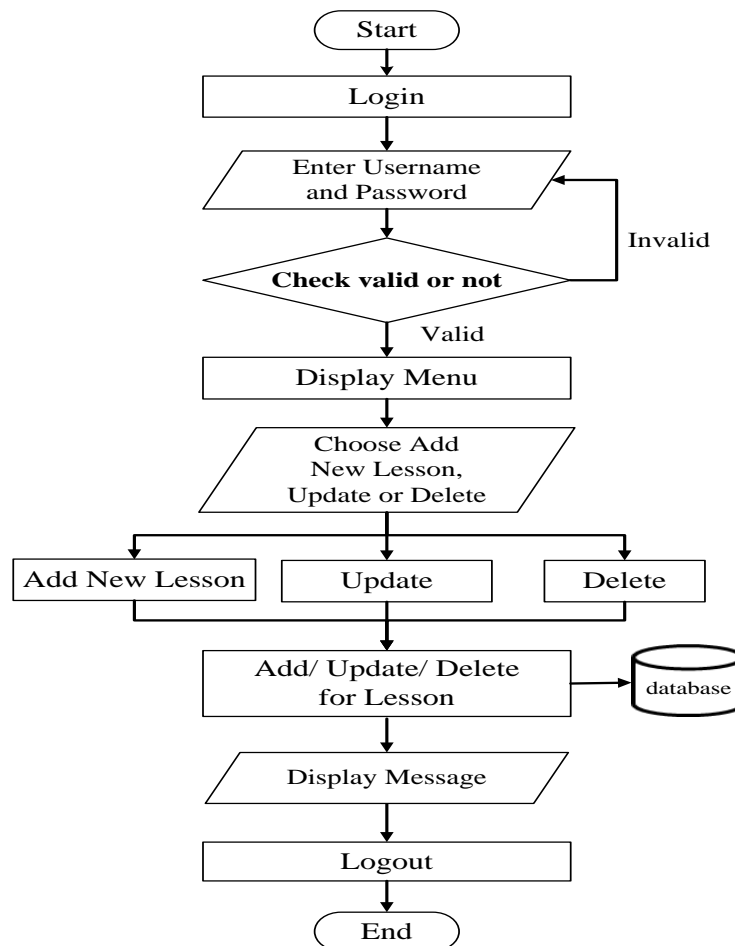
Figure 4.1 System Flow Diagram (Administrator)

Figure 4.2 describes the system flow of student for the application. If the student is old user, it only needs to log in and if not it needs to sing in. After that the student chooses the session to practise and do the exercise. The last step is the important step to evaluate this mobile application. Most of the users can't decide the good decision for evaluating the application. To get the good decision, the user needs to choose their preference on the alternatives and criteria. According to the AHP model, this session displays based on percentage.
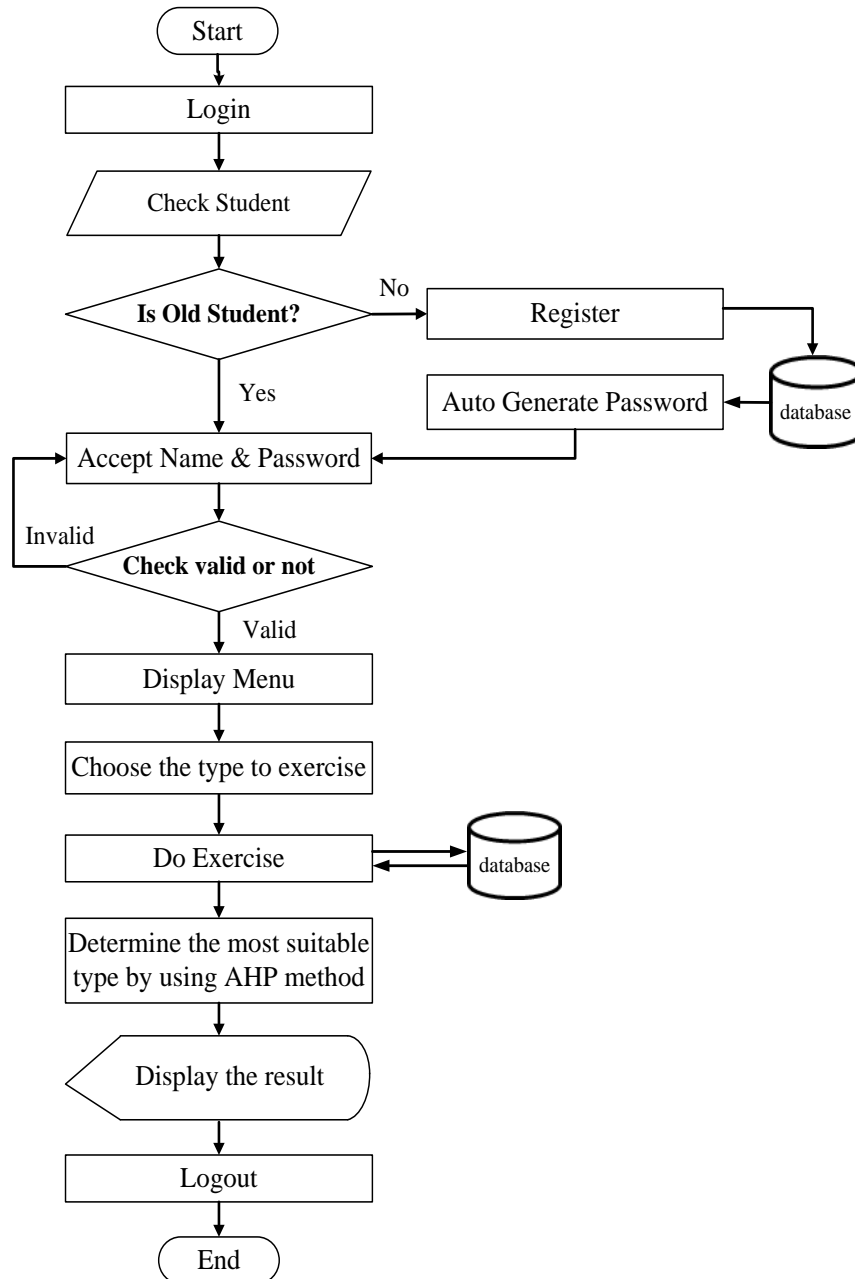
Figure 4.2 System Flow Diagram (Student)

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4.2 Database Design of the Proposed System

There are seven tables that are used for database relationship in this system. These tables are Admin, Student, Reading, Listening, Grammar, Analytic, and Criteria tables which are chosen by students.
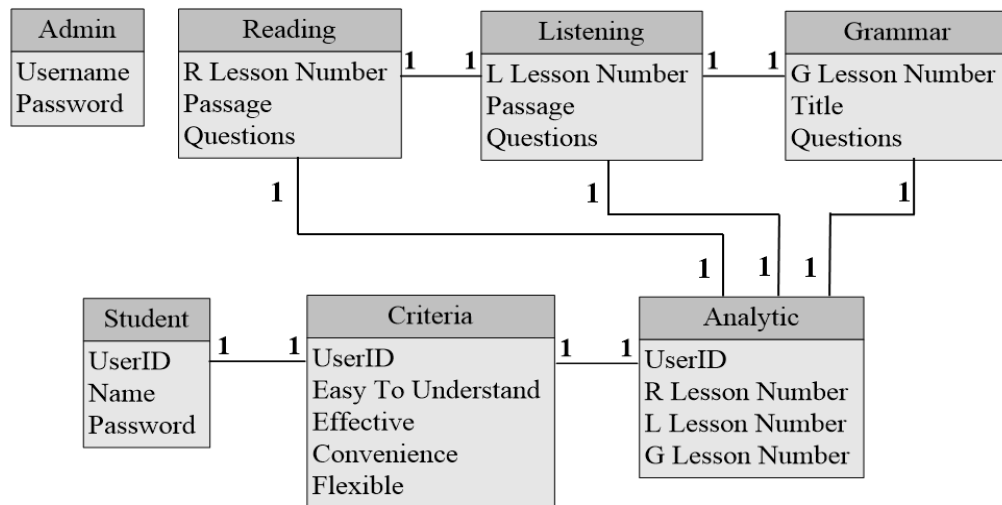
Figure 4.3 Database Design of the Proposed System

4.3 Use Case Design of the Proposed System
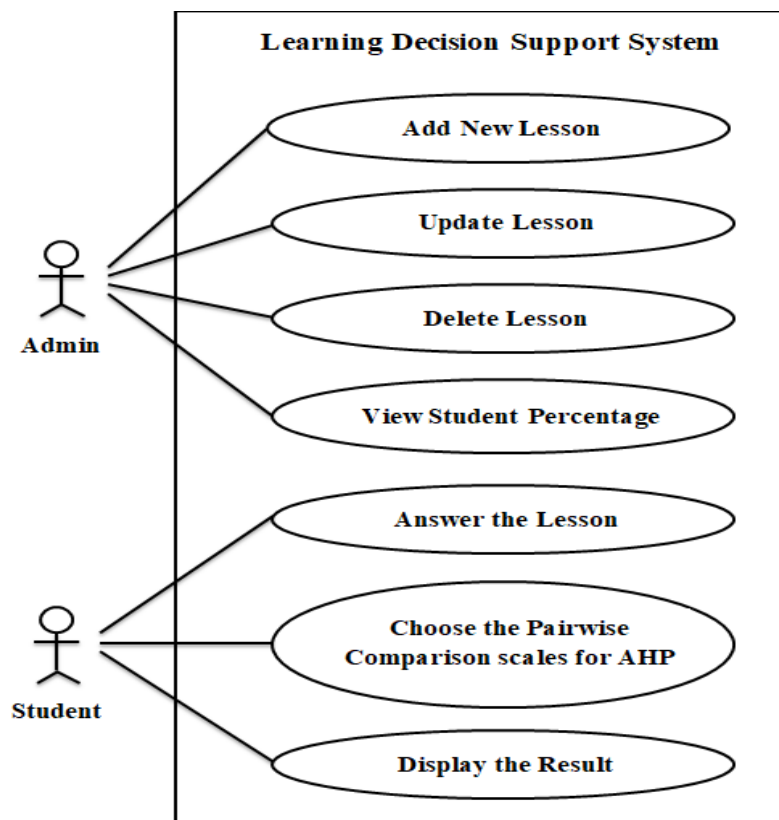
Figure 4.4 Use Case Design of the Proposed System

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4.4 Pairwise Comparison for Decision Making Process

In our proposed system, there are four criteria (Easy to Understand, Effective, Convenience and Flexible) and three alternatives (Reading, Listening and Grammar) to make which session is the best decision to evaluate the mobile application. There are five steps of AHP.

Step 1: Define the criteria (i=1, 2,…., m) and alternatives (j=1, 2,…., n).

Step 2: Determine their relative priority p_i with respect to the objective and for each criterion i in performing pairwise comparisons.

Step 3: Compare the j=1, 2,…,n alternatives and determine their relative priority p_{ij} with respect to criteria i.

Step 4: The system determines the final alternative priority P_j with respect to all the criteria.

Step 5: The alternatives are ranked by R_j. The most preferred alternatives is the one having the largest R_j.

Step 1: Define criteria and alternatives.
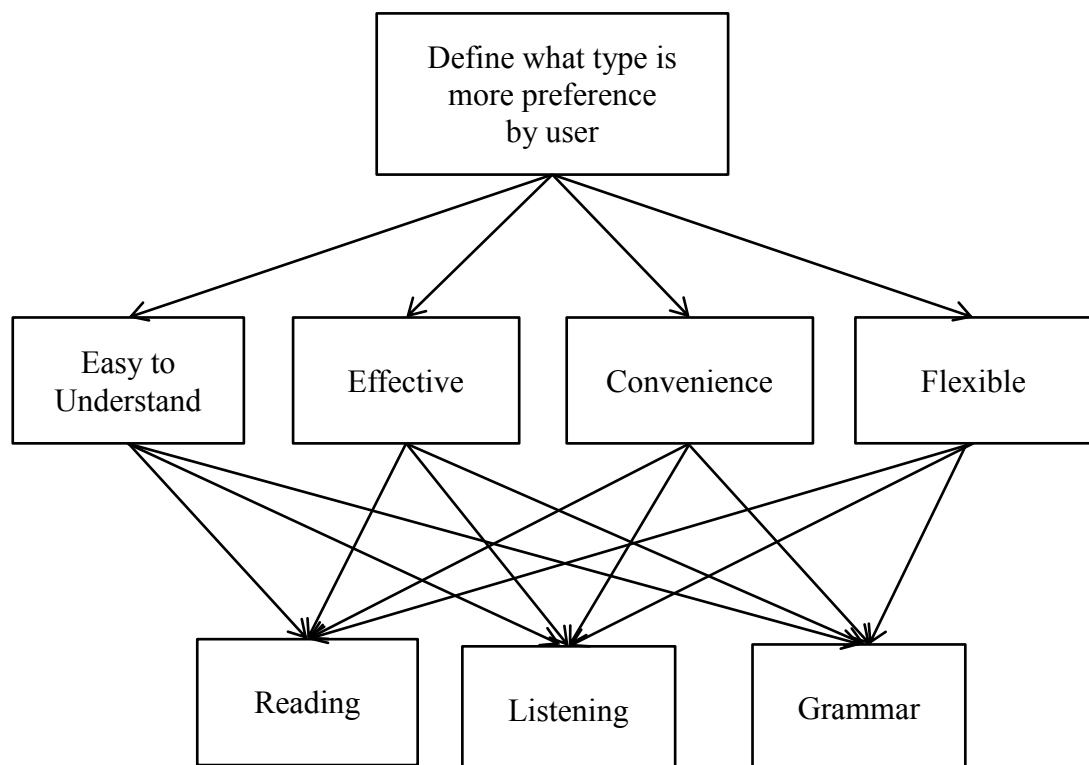
Figure 4.5 Hierarchy Structure of Application

Step 2: Pair – Wise Comparison Scales for AHP

Table 4.1 Pair – Wise Comparison Scales for AHP

Value	Definition	Explanation
1	Same important	Two activities contribute equally to objective 1.
3	Slightly more important	Experience and judgment slightly favor one activity over another.
5	More important	Experience and judgment strongly favor one activity over another.
7	Lot more important	An activity is strongly favored, and dominance is demonstrated in practice.
9	Totally dominates	The evidence favoring one activity over another is the highest possible order of affirmation.

Using geometric mean of the a_{ij}^k, k=1, 2,…, h

$$M_i = (a_{ij}^{1} * a_{ij}^{2} *...* a_{ij}^{h}) = \sqrt[h]{\prod_{k=1}^{h} a_{ij}^{k}} \qquad (4.1)$$

Where M_i is the geometic mean of a_{ij}^k, a_{ij} is the element a of row i and column j of the matrix, and k, and h is the frequency of the element a.

The relative priority P_i of the criterion

$$P_i = \frac{M_i}{\sum_{i=1}^{h} M_i} \qquad (4.2)$$

Where P_i is the priority of criterion i, M_i is the geometric mean of the element a of row i and column j of the matrix, and h is the frequency of the element a.

Table 4.2 Pair – Wise Comparison Matrix for Criteria

Criteria	Easy to Understand	Effective	Convenience	Flexible	Priority (P_i)
Easy to Understand	1	5	7	9	0.64
Effective	1/5	1	3	5	0.20
Convenience	1/7	1/3	1	7	0.12
Flexibility	1/9	1/5	1/7	1	0.37

$$M_1 = \sqrt[4]{1*5*7*9} \qquad = \sqrt[4]{315} \qquad = 4.21$$

$$M_2 = \sqrt[4]{1/5*1*3*5} \qquad = \sqrt[4]{3} \qquad = 1.32$$

$$M_3 = \sqrt[4]{1/7*1/3*1*7} \qquad = \sqrt[4]{1/3} \qquad = 0.76$$

$$M_4 = \sqrt[4]{1/9*1/5*1/7*1} \qquad = \sqrt[4]{1/315} = 0.24$$

The priority P_i of the row of the matrix

$$P_1 = \frac{M_1}{M_1+M_2+M_3+M_4} = \frac{4.21}{4.21+1.32+0.76+0.24} = \frac{4.21}{6.53} = 0.64$$

$$P_2 = \frac{M_2}{M_1+M_2+M_3+M_4} = \frac{1.32}{4.21+1.32+0.76+0.24} = \frac{1.32}{6.53} = 0.20$$

$$P_3 = \frac{M_3}{M_1+M_2+M_3+M_4} = \frac{0.76}{4.21+1.32+0.76+0.24} = \frac{0.76}{6.53} = 0.12$$

$$P_4 = \frac{M_4}{M_1+M_2+M_3+M_4} = \frac{0.24}{4.21+1.32+0.76+0.24} = \frac{0.24}{6.53} = 0.37$$

Step 3: Alternatives Respect to Easy to Understand

$$M_j = (a_{ij}{}^1 * a_{ij}{}^2 *...* a_{ij}{}^h) = \sqrt[h]{\prod_{k=1}^{h} a_{ij}{}^k} \qquad (4.3)$$

Where M_j is the geometic mean of $a_{ij}{}^k$, a_{ij} is the element a of row i and column j of the matrix, and k, h is the frequency of the element a.

The relative priority P_j of the alternative with respect to criterion **i**

$$P_j = \frac{M_j}{\sum_{j=1}^{h} M_j} \qquad (4.4)$$

Where P_j is the priority of the alternative j with respect to criterion i, M_j is the geometic mean of the element a of row i and column j of the matrix, and h is the frequency of the element a.

Table 4.3 Alternatives Respect for Easy To Understand

Easy to Understand	Reading	Listening	Grammar	Relative Priority
Reading	1	3	5	0.60
Listening	1/3	1	7	0.32
Grammar	1/5	1/7	1	0.08

$$M_1 = \sqrt[3]{1 * 3 * 5} \qquad = 2.47$$

$$M_2 = \sqrt[3]{1/3 * 1 * 7} \qquad = 1.32$$

$$M_3 = \sqrt[3]{1/5 * 1/7 * 1} \qquad = 0.31$$

$$P_1 = \frac{M_1}{M_1 + M_2 + M_3} = \frac{2.47}{2.47 + 1.32 + 0.31} = 0.60$$

$$P_2 = \frac{M_2}{M_1 + M_2 + M_3} = \frac{1.32}{2.47 + 1.32 + 0.31} = 0.32$$

$$P_3 = \frac{M_3}{M_1 + M_2 + M_3} = \frac{0.31}{2.47 + 1.32 + 0.31} = 0.08$$

Alternatives Respect to Effective

Table 4.4 Alternatives Respect to Effective

Effective	Reading	Listening	Grammar	Relative Priority
Reading	1	5	7	0.69
Listening	1/5	1	9	0.26
Grammar	1/7	1/9	1	0.05

$$M_1 = \sqrt[3]{1 * 5 * 7} \qquad = 3.27$$

$$M_2 = \sqrt[3]{1/5 * 1 * 9} \qquad = 1.22$$

$$M_3 = \sqrt[3]{1/7 * 1/9 * 1} \qquad = 0.25$$

$$P_1 = \frac{M_1}{M_1 + M_2 + M_3} = \frac{3.27}{3.27 + 1.22 + 0.25} = 0.69$$

$$P_2 = \frac{M_2}{M_1 + M_2 + M_3} = \frac{1.22}{3.27 + 1.22 + 0.25} = 0.26$$

$$P_3 = \frac{M_3}{M_1 + M_2 + M_3} = \frac{0.25}{3.27 + 1.22 + 0.25} = 0.05$$

Alternatives Respect to Convenience

Table 4.5 Alternatives Respect to Convenience

Convenience	Reading	Listening	Grammar	Relative Priority
Reading	1	7	3	0.66
Listening	1/7	1	9	0.26
Grammar	1/3	1/9	1	0.08

$M_1 = \sqrt[3]{1 * 7 * 3}$ $\quad\quad\quad = 2.76$

$M_2 = \sqrt[3]{1/7 * 1 * 9}$ $\quad\quad\quad = 1.09$

$M_3 = \sqrt[3]{1/3 * 1/9 * 1}$ $\quad\quad = 0.33$

$P_1 = \dfrac{M_1}{M_1+M_2+M_3} = \dfrac{2.76}{2.76+1.09+0.33} = 0.66$

$P_2 = \dfrac{M_2}{M_1+M_2+M_3} = \dfrac{1.09}{2.76+1.09+0.33} = 0.26$

$P_3 = \dfrac{M_3}{M_1+M_2+M_3} = \dfrac{0.33}{2.76+1.09+0.33} = 0.08$

Alternatives Respect to Flexible

Table 4.6 Alternatives Respect to Flexible

Flexible	Reading	Listening	Grammar	Relative Priority
Reading	1	9	5	0.76
Listening	1/9	1	3	0.15
Grammar	1/5	1/3	1	0.09

$M_1 = \sqrt[3]{1 * 9 * 5}$ $\quad\quad\quad = 3.56$

$M_2 = \sqrt[3]{1/9 * 1 * 3}$ $\quad\quad\quad = 0.69$

$M_3 = \sqrt[3]{1/5 * 1/3 * 1}$ $\quad\quad = 0.41$

$P_1 = \dfrac{M_1}{M_1+M_2+M_3} = \dfrac{3.56}{3.56+0.69+0.41} = 0.76$

$P_2 = \dfrac{M_2}{M_1+M_2+M_3} = \dfrac{0.69}{3.56+0.69+0.41} = 0.15$

$P_3 = \dfrac{M_3}{M_1+M_2+M_3} = \dfrac{0.41}{3.56+0.69+0.41} = 0.09$

Step 4: Determines the final alternative's relative Rank R_j with respect to all criteria. The rank formula of pairwise comparison is

$$R_j = \sum_{i=1}^{h} P_i * p_{ij} \tag{4.5}$$

Where R_j is the rank of the alternatives with respect to all criteria, P_i is the priority of criterion i, p_{ij} is the priority of the alternative j with respect to criterion i, and h is the

frequency of the element a.

$$\begin{pmatrix} \text{Reading} \\ \text{Listening} \\ \text{Grammar} \end{pmatrix} = 0.\,64 \begin{pmatrix} 0.60 \\ 0.32 \\ 0.08 \end{pmatrix} + 0.20 \begin{pmatrix} 0.69 \\ 0.26 \\ 0.05 \end{pmatrix} + 0.12 \begin{pmatrix} 0.66 \\ 0.26 \\ 0.08 \end{pmatrix} + 0.37 \begin{pmatrix} 0.76 \\ 0.15 \\ 0.09 \end{pmatrix}$$

$$= \begin{pmatrix} 0.384 \\ 0.2048 \\ 0.0512 \end{pmatrix} + \begin{pmatrix} 0.138 \\ 0.052 \\ 0.01 \end{pmatrix} + \begin{pmatrix} 0.0792 \\ 0.0312 \\ 0.0096 \end{pmatrix} + \begin{pmatrix} 0.2812 \\ 0.0555 \\ 0.0333 \end{pmatrix}$$

$$= \begin{pmatrix} 0.8824 \\ 0.3435 \\ 0.1041 \end{pmatrix}$$

Step 5: Ranking the alternatives and the most preferred alternatives is the one having the largest.

Table 4.7 Final Evaluation Result

Type	Priorities
Reading	0.8824
Listening	0.3435
Grammar	0.1041

Using the above information, it can calculate the priorities. It obtained that "Reading" type has the highest priority followed by "Listening" and "Grammar". So, "Reading" is selected as the best alternative.

Then "Grammar" type is lowest priority, so administrator needs to update the "Grammar" type.

4.5 Implementation of the System

To use this proposed system, users need to own android phone with the operation system version 4.0 at least and to install English Learning application. By starting the application, the user needs to choose admin or student. The administrator can update, delete and add lessons for reading, listening and grammar sections. The login page of admin and student shows in Figure 4.6.
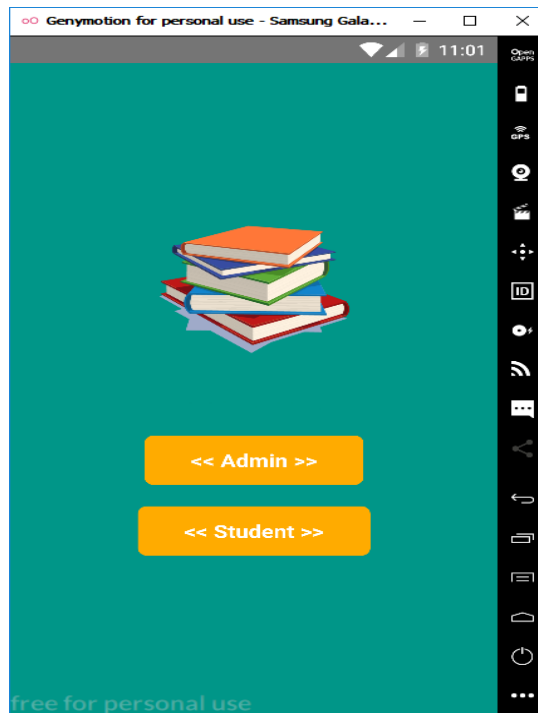
Figure 4.6 Login Page of the System

After admin goes from login step, there are four sessions (reading, listening, grammar lesson and grammar practice sessions) can update, delete and insert lessons as shown in Figure 4.7. Admin can delete entire lessons and upload the new lessons or update the passage in reading and questions for each lesson.
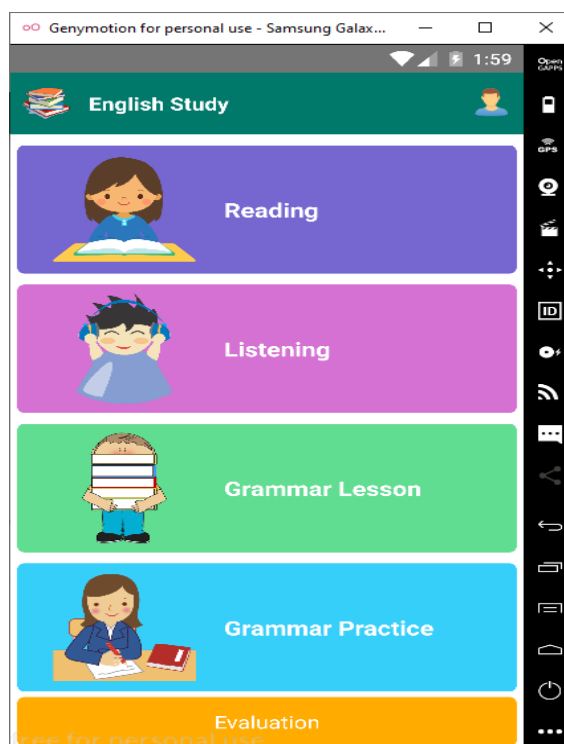
Figure 4.7 Four Sessions from Admin Side

Figure 4.8 displays Reading session from Admin side, the administrator can delete, update and upload new reading paragraph by hitting reading button. Similarity, listening, grammar lesson and grammar practice session can do the same things.

Figure 4.8 Update Lesson for Reading

The admin can upload in two types, the first type is to upload already pdf file format and can type the sentence in the box as shown in Figure 4.9.
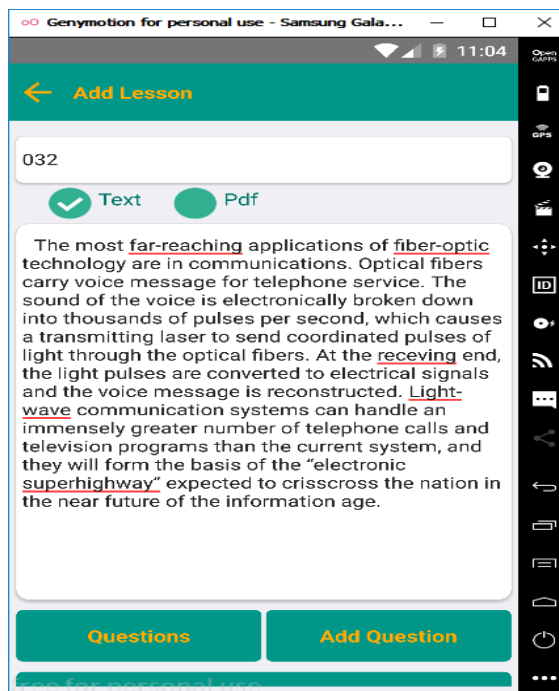
Figure 4.9 Two Views of Reading

The admin must type the questions and answers for the above paragraph and then can choose the number of answers. (see Figure 4.10)
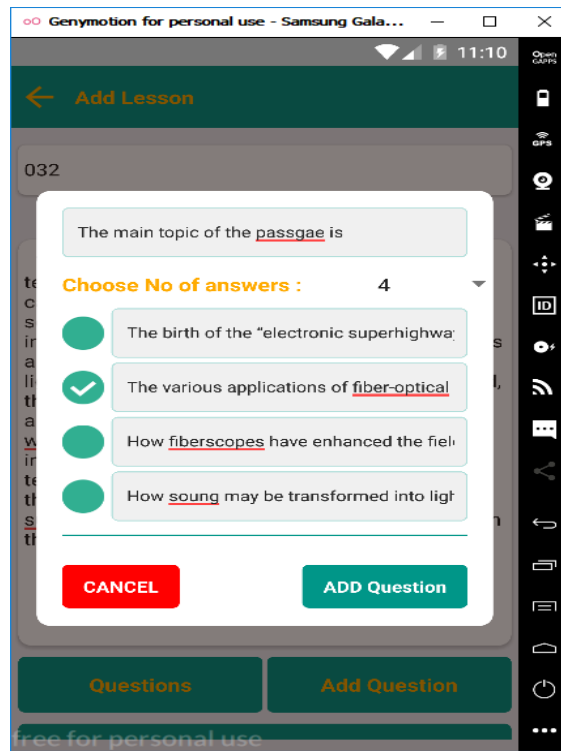
Figure 4.10 Enter Questions Form of Reading

After the add question button is clicked, the question forms appear as shown in Figure 4.11.
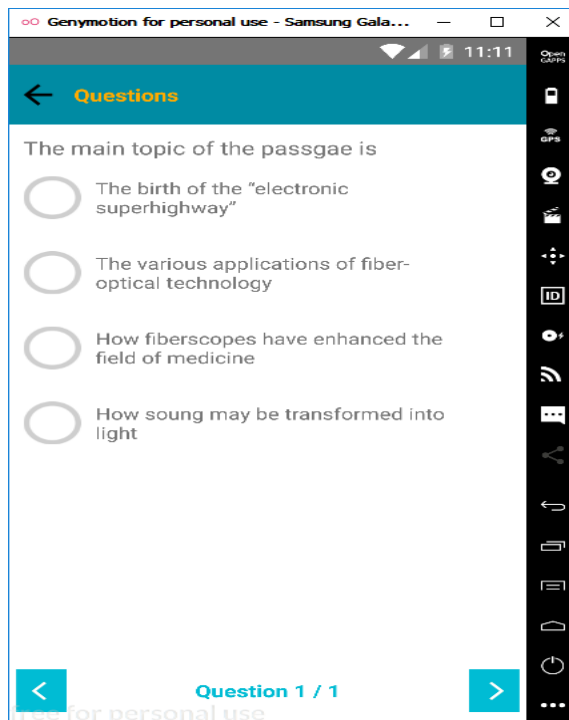
Figure 4.11 Questions Form of Reading

After successfully upload the lessons for each session, the message will be shown in Figure 4.12.
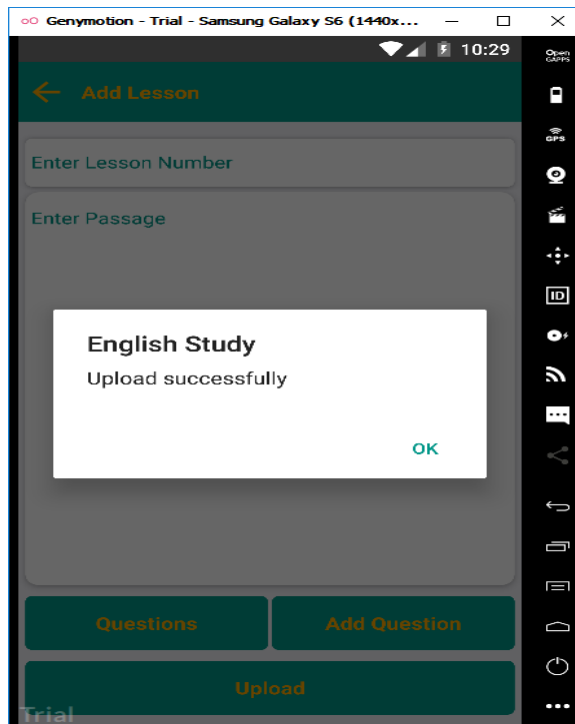
Figure 4.12 Upload Successful Message of Reading

The admin can update, delete and upload new listening by hitting listening button as shown in Figure 4.13.
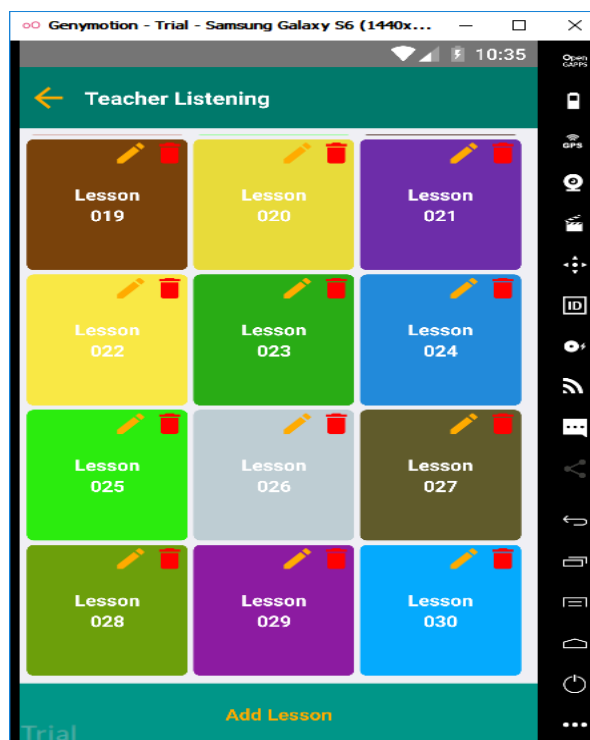
Figure 4.13 Update Lesson for Listening

The administrator can upload in two types, the first is to type the sentence and can upload already pdf file format in the box as shown in Figure 4.14.
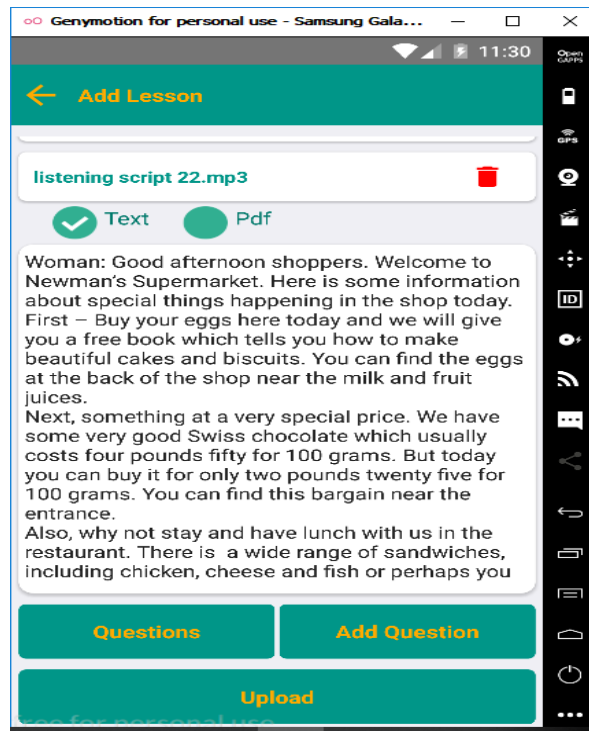
Figure 4.14 Two Views of Listening

The admin must type the questions and answers for the above paragraph and then can choose the number of answers as shown in Figure 4.15.
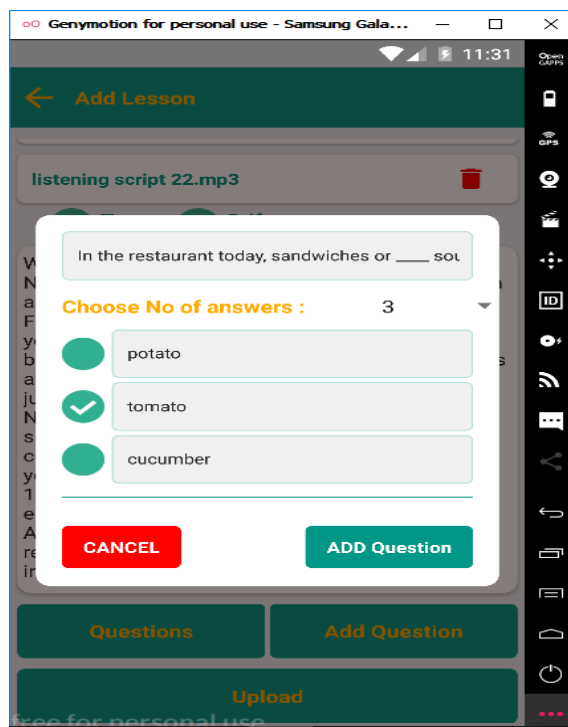
Figure 4.15 Enter Questions Form of Listening

After successfully upload the lessons for each session, the message will be shown in Figure 4.16.
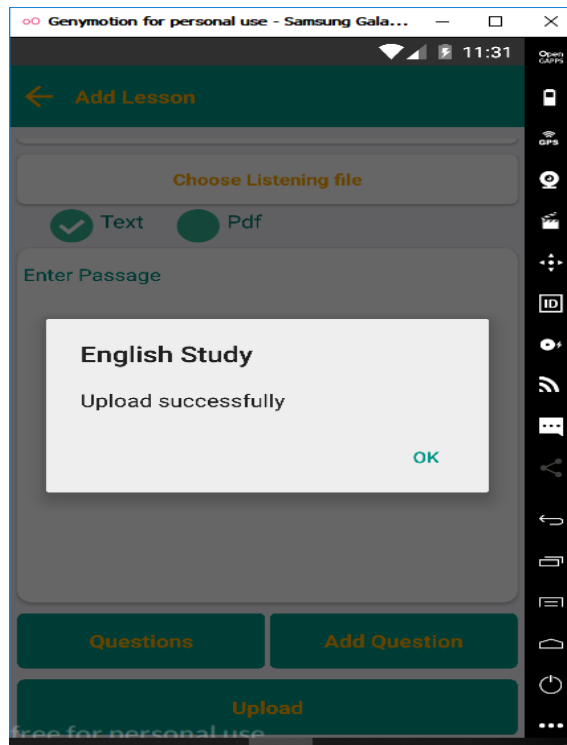
Figure 4.16 Upload Successful Message of Listening

The student can study the grammar lesson and can practise the grammar exercise for the improvement of student's ability. (see Figure 4.17)
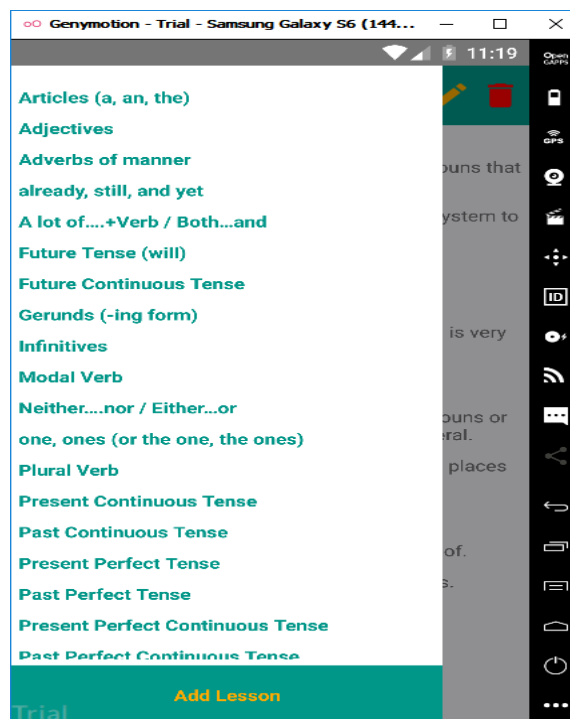
Figure 4.17 Grammar Lesson

The administrator has to type the grammar type, explanation and example for grammar lesson. (see Figure 4.18)
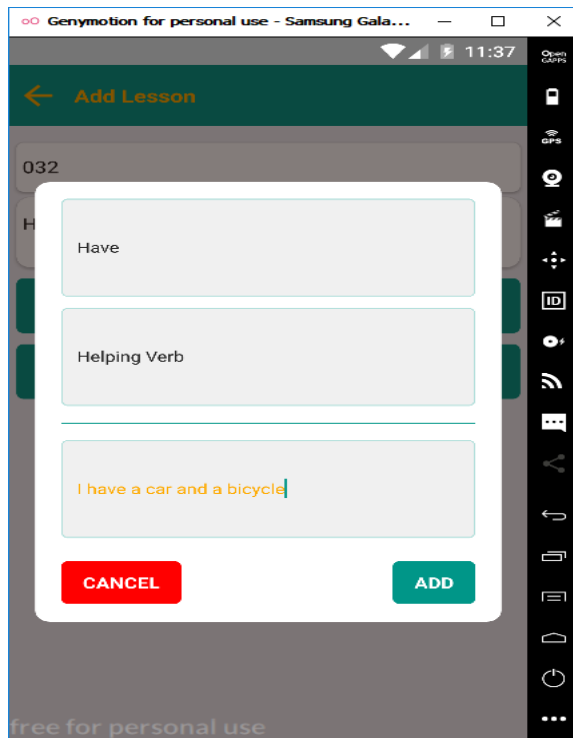
Figure 4.18 A View of Grammar Lesson

In this page, this figure shows the administrator can add the question type for grammar lesson. (see Figure 4.19)
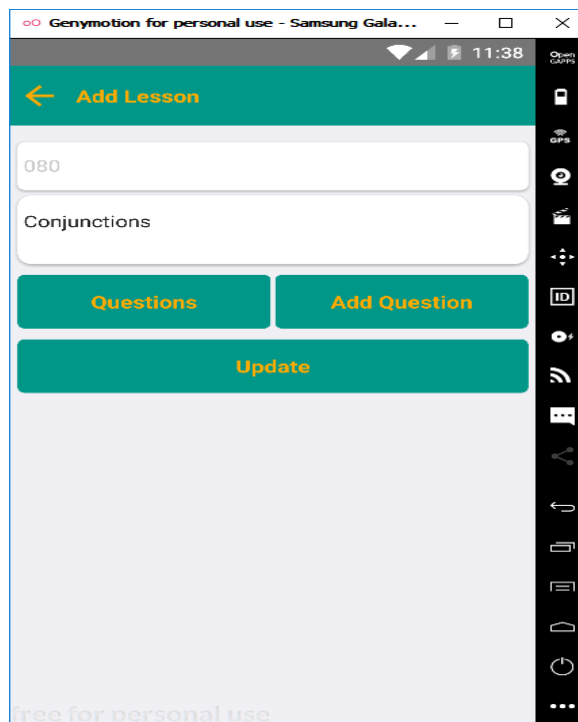
Figure 4.19 Do Test for Grammar Lesson

The admin adds the questions and answers for grammar practice and can choose the number of answers as shown in Figure 4.20.
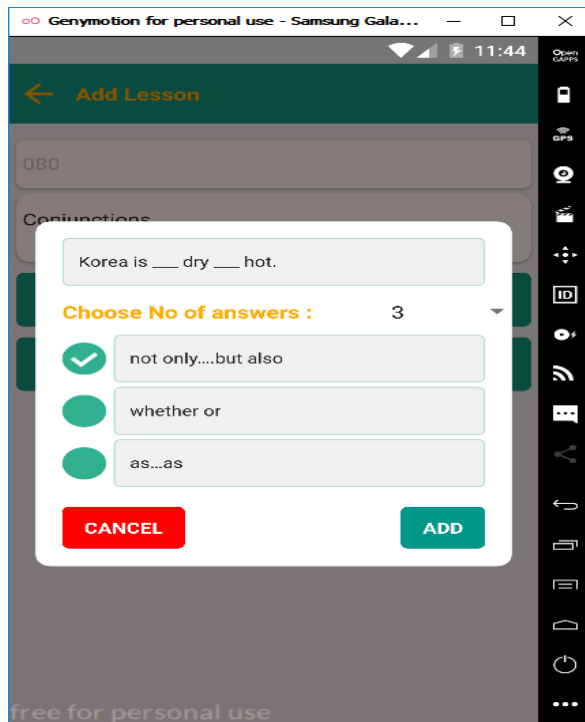
Figure 4.20 Add Questions for Grammar Practice

After successfully upload the lesson for each session, the message will be shown in Figure 4.21.
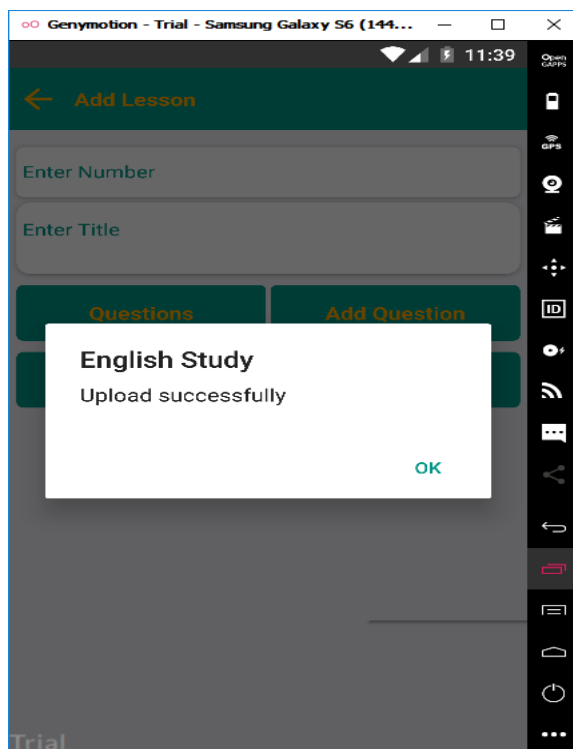
Figure 4.21 Upload Successful Message for Grammar

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This analytic page is rating of 120 students received from the student side. (see Figure 4.22)
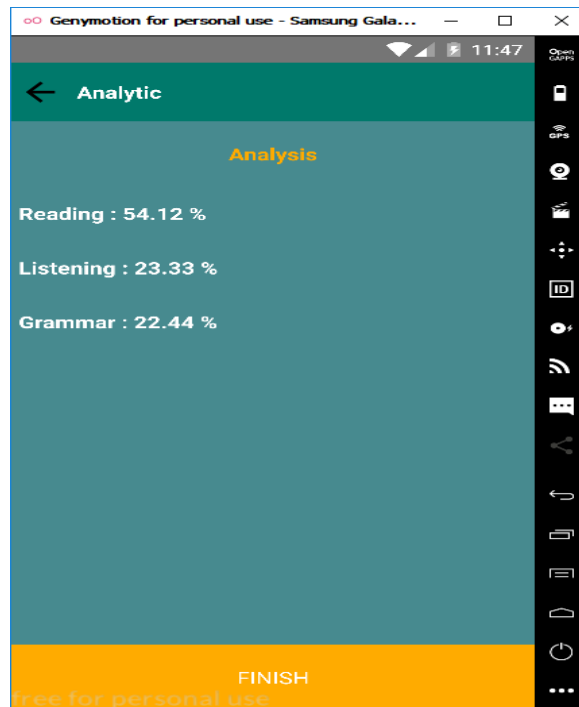
Figure 4.22 Overall Rating of the Students from Admin Side

By testing 120 students, the best session is reading and the worst is grammar as shown in Figure 4.23. So, according to this analysis, the admin side needs to update the grammar session.
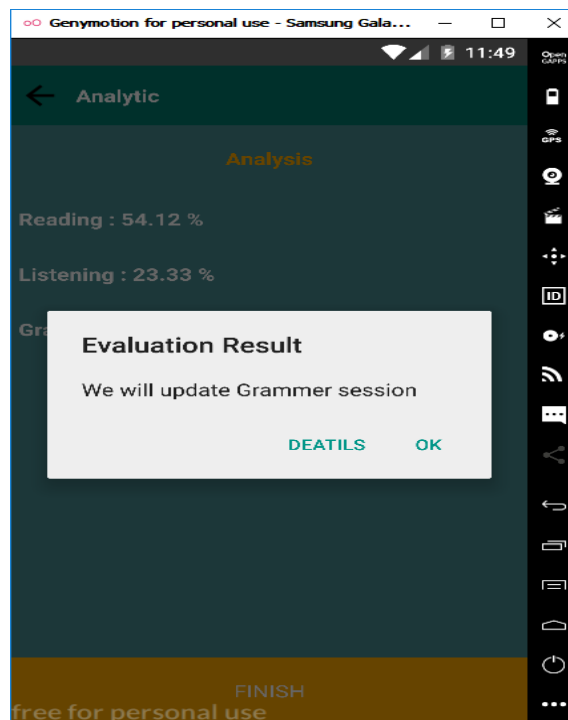
Figure 4.23 Evaluation Result of the System

For student side, an existing student can login from Login button and new student can register from Register button and new student will get the password for the next time login as shown in Figure 4.24.
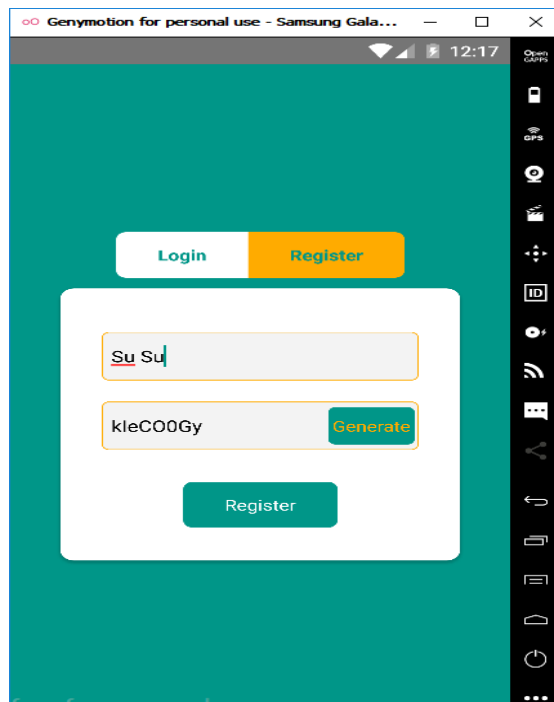
Figure 4.24 Register Form for Student

After entering the login page, the user can choose four sessions, reading, listening, grammar lesson and grammar practice button as shown in Figure 4.25.
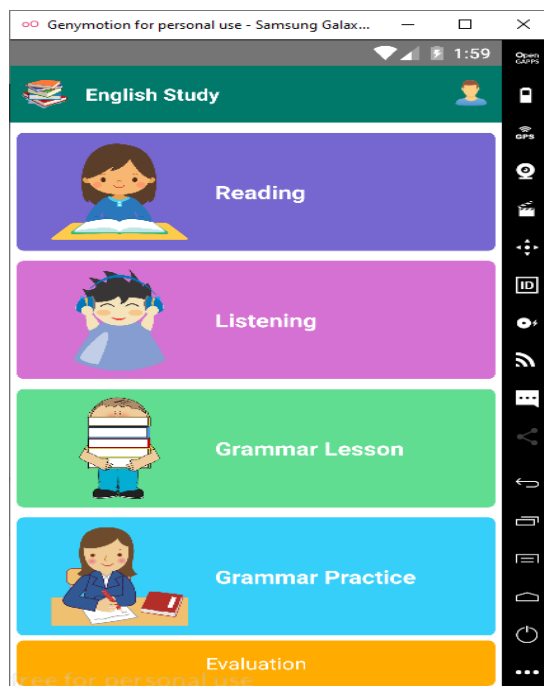
Figure 4.25 Four Sessions from Student Side

By choosing one of the sessions, the student can test the exercise for each session and then must check for agree or disagree the lesson in Figure 4.26.
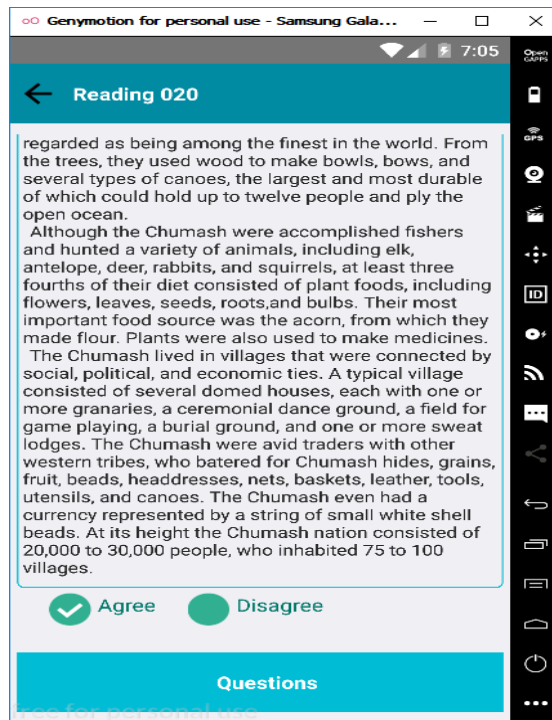
Figure 4.26 Choosing the Lesson for Reading

This page answers the questions, clicks the submit button for checking the answer and sees the correct answer in Figure 4.27.
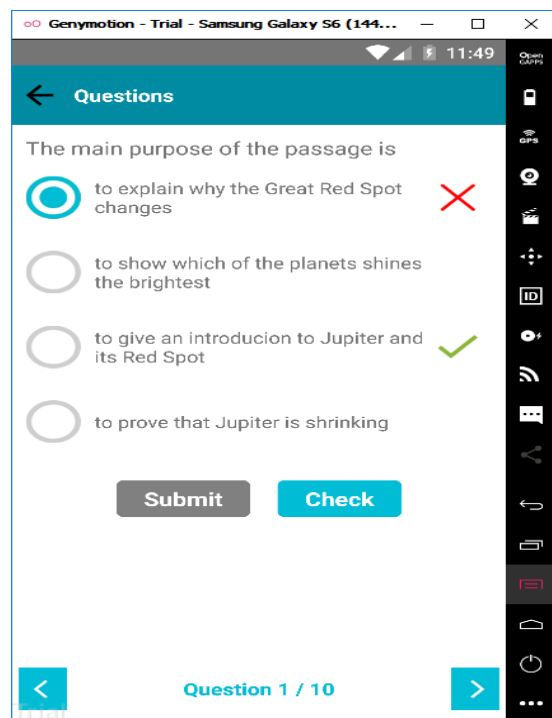
Figure 4.27 Questions from Student Side for Reading

After answering the questions, the result form appears and the student can also go to the main page from the result form as shown in Figure 4.28.
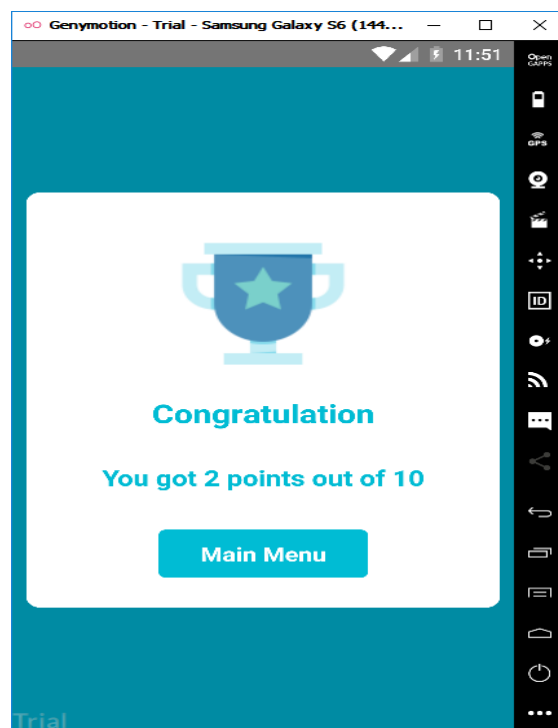
Figure 4.28 Result form from Student Side

The student listens the audio file and tests the exercise for listening session in Figure 4.29.
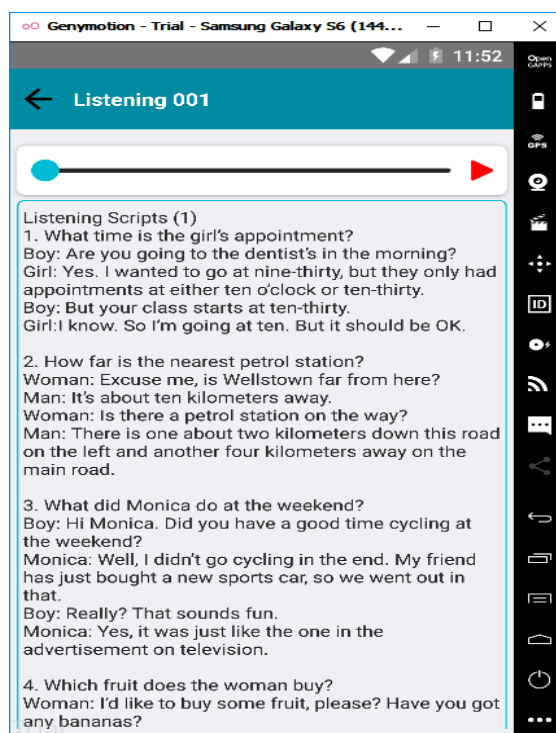
Figure 4.29 A View of Listening

This listening page answers the questions, clicks the submit button for checking the answer and sees the correct answer from student side in Figure 4.30.
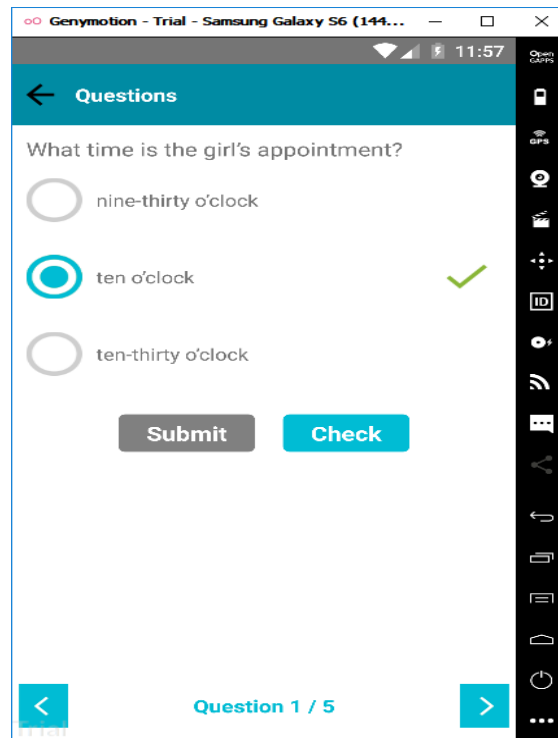
Figure 4.30 Questions from Student Side for Listening

The students study the grammar lesson and the examples of this lesson as shown in Figure 4.31.
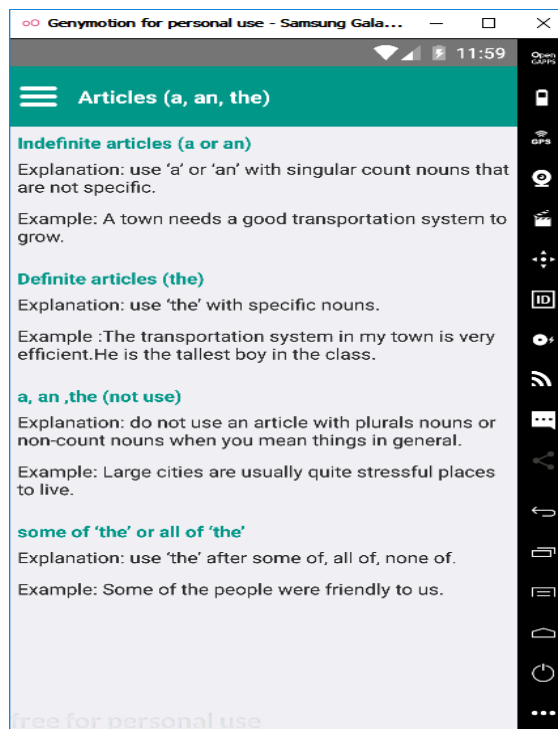
Figure 4.31 Grammar Lesson form Student Side

After students learn the rules, they test the exercise for grammar practice in Figure 4.32.
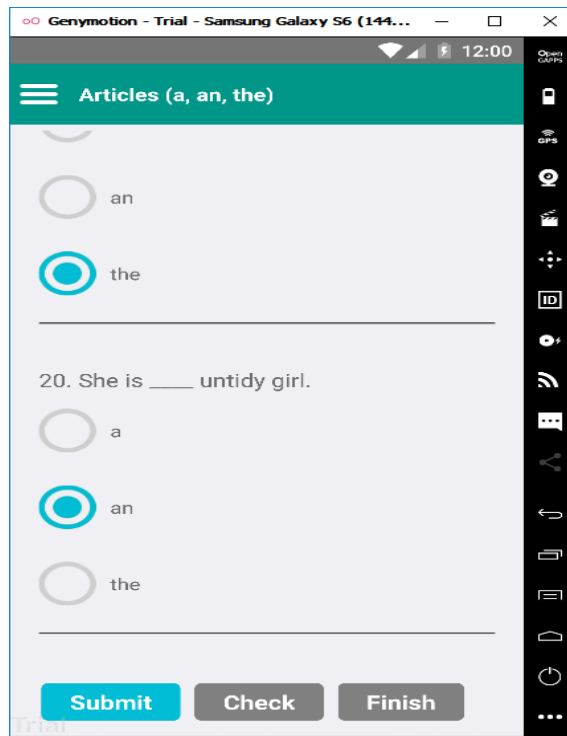
Figure 4.32 Questions from Student Side for Grammar

After doing the exercise, students must choose pairwise comparison values for criteria as shown in Figure 4.33.
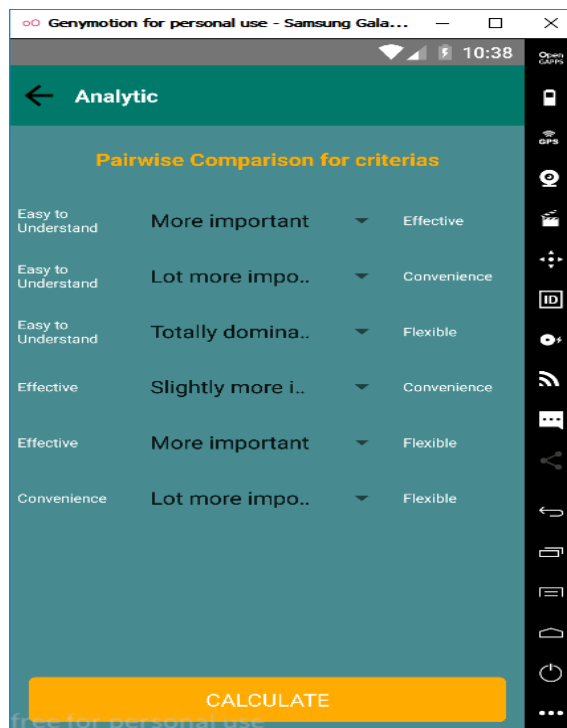
Figure 4.33 Pairwise Comparison for Criteria

The students have to choose again alternatives respect to criteria to decide the best session for the application in Figure 4.34
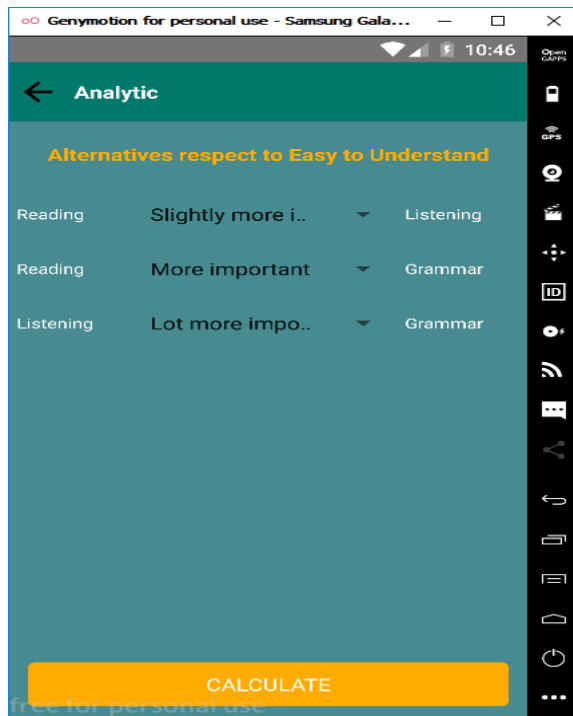
Figure 4.34 Pairwise Comparison for Alternatives

This page is the rank of the sessions based on the user's preference by using AHP method. (see Figure 4.35)
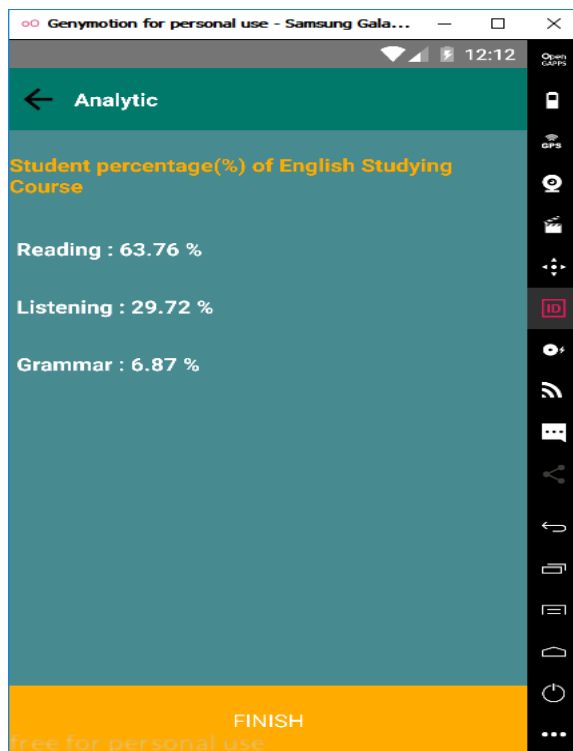
Figure 4.35 Percentage of the Evaluation

4.5.1 Experimental Result

The data of users added by the application is stored in the database. (see Figure 4.36)

Figure 4.36 User Database of the System

The percentage of each student is calculated in the AHP method and stored in this database. (see Figure 4.37)

Figure 4.37 Analytic Database of the System

The lessons that each student checked are stored in this database. (see Figure 4.38)

name	lesson	count	type	id
May Phue Pyae Sone	010	1	listening	11
Shwe Yamin Oo	...	1	grammer book	21
Thet Su Pan	002	1	reading	22
Nyein Nyein Aung	012	1	listening	23
Thin Sandi Tun	016	1	reading	24
Kyal Sin Thu	...	1	grammer pratice	25
Kaung Myat Aung	007	1	listening	26
Thiri	...	1	grammer pratice	32
Aye Thinzar Lwin	...	1	grammer pratice	33
Ye Lin Thu	008	1	listening	34
Thurein Oo	029	1	reading	35
Min Khant Maung	...	1	grammer book	36
Yamone Oo Wai	...	1	grammer book	37
Htet Htet Aung	007	1	reading	38
Zaw Aung Naing	008	1	listening	39
Aung Kyaw Naing	...	1	grammer book	40
Thu Rain Nay Win	005	1	listening	41
Myint Myat Moe	...	1	grammer book	42
Pyae Phyo	019	1	listening	43
Kyaw Swar Lwin	...	1	grammer pratice	44
Hein Khant Zin	028	1	reading	45
Khit Thit May	...	1	grammer book	46
Hein Moh Thu	012	1	listening	47
Chan Chan	...	1	grammer pratice	48
Ei Yupar Aung	004	1	listening	49
Hnin Htet	012	1	reading	50

Database: thesis   **Table**: answerrecord

Figure 4.38 Record Database of the System

Our data implemented by cloud server for the application. (see Figure 4.39)

Figure 4.39 Digital Ocean Page

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For the application, the organization bought cloud server form Digital Ocean by $5 per month because it uses lesson data to support students in the system. (see Figure 4.40)
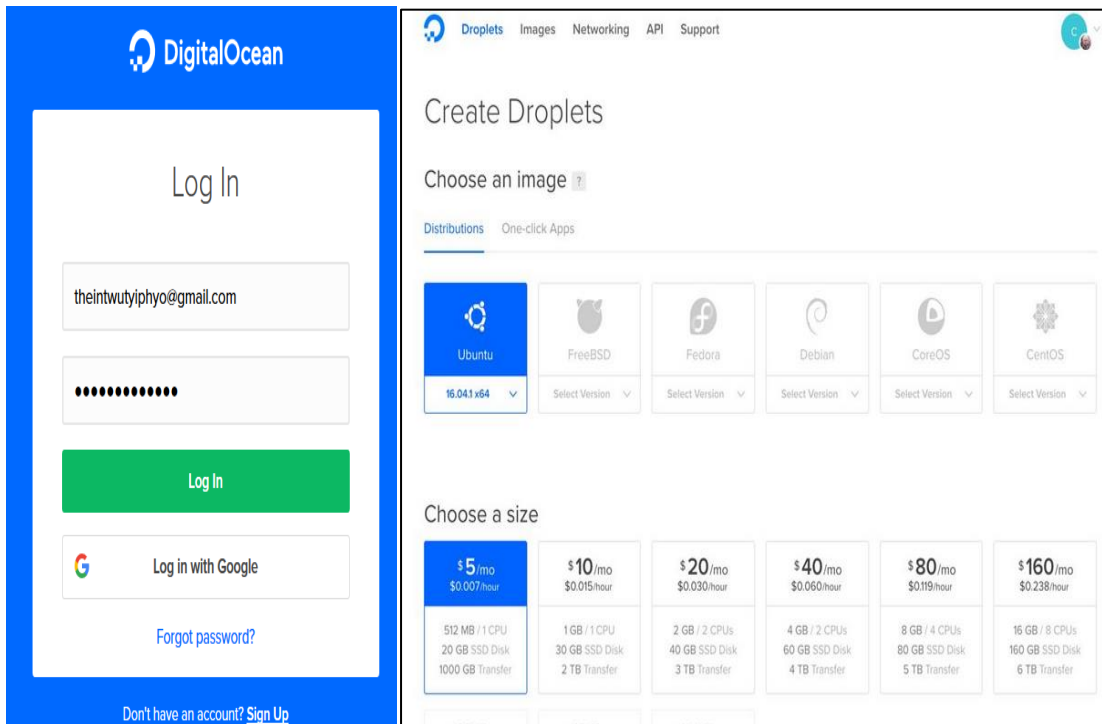
Figure 4.40 Buying Cloud Server for a Month

The mail box comes from Digital Ocean, which contains the IP address, username and password. (see Figure 4.41)
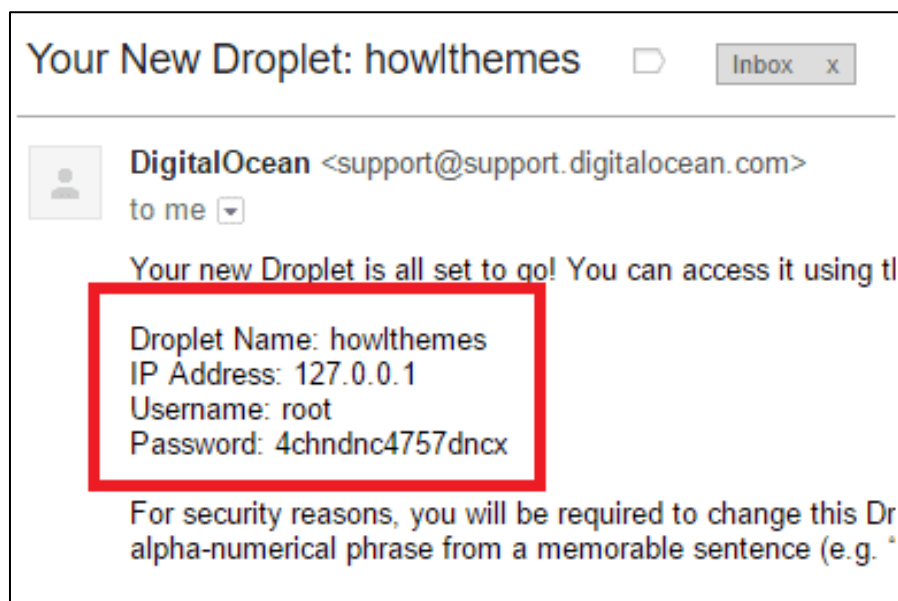
Figure 4.41 Mail box from Digital Ocean

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This command prompt connects to the node js cloud server with IP address. (see Figure 4.42)

Figure 4.42 Command Prompt for Node js Cloud Server

Type IP address, username and password in the mail provided by Digital Ocean and connect to MYSQL host database. And then the admin divides and uses the tables in the MYSQL host database. (see Figure 4.43)

Figure 4.43 MYSQL Host Database

CHAPTER 5
CONCLUSION, LIMITATIONS AND FURTHER EXTENSION

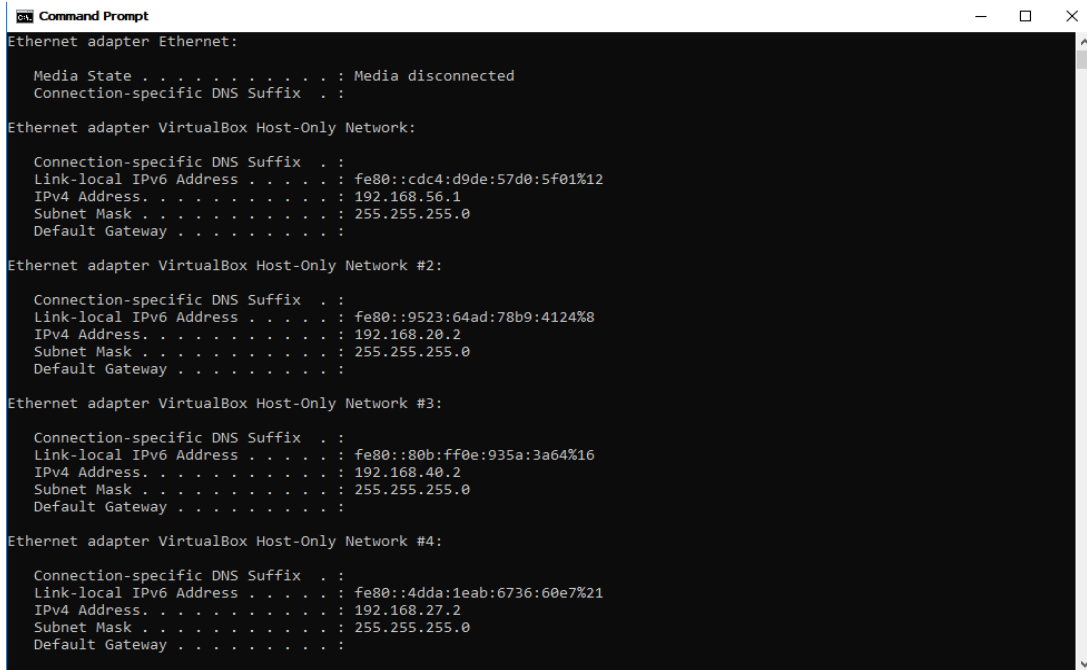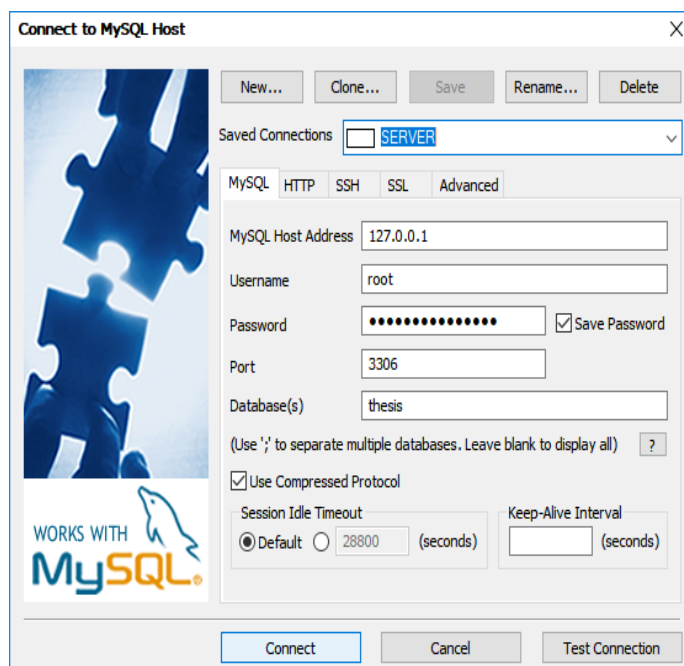The system is implemented decision support system for evaluation the English study mobile application using Analytical Hierarchy Process. The first part in this system is administration side that is the creating the mobile application for English Study course. After checking the valid of the administrator, admin needs to choose which session they need to update the lessons. After choosing the lesson, the admin can insert, delete and update the lessons. The updated lessons are stored in the lesson database and are seen the lessons which are already updated from student side.

The second part is student side which is to exercise the lessons and to evaluate this mobile application using AHP model. If the student is old user in the student side, it only needs to log in and if not it needs to sing in. After that the student chooses the session to practise and do the exercise. The last step is the important step to evaluate this mobile application. In the proposed system, there are four criteria (Easy to Understand, Effective, Convenience and Flexible) and three alternatives (Reading, Listening and Grammar) which influence the user's selected decision. The mobile based decision support system sustains the analysis tool for the users and support educational areas. By using this system, the users can do English Language exercises easily in mobile application. AHP methodology can be applied to make a decision in selecting for the most appropriate part of leaning English (reading, listening and grammar).

And then this system can be reduced personal judgment. The analytical hierarchy process has been presented in many research papers and it is practically useful. There are critics of the system. It's a beneficial supplement to other subjective and objective techniques that calculate product quality. The student can recognize easy and powerful the technique when used to display the quality. Moreover, the student can practise the technique in other fields. The organization is intended to become better lessons at the teaching part and to improve the intelligence of the student.

5.1 System Limitations

The main limitation of this system is users need to be android phone with the operation system version 4.0 at least. The users must be requested the input data from the student side for certain criteria to calculate pairwise comparison of AHP method. This system can use mobile learning system for evaluating English study course but cannot be used similarly at other major courses.

5.2 Further Extension

This application is only implemented on android version, so, it can also be implemented the IOS version and actually there are four skills in English Language. So, writing session will be implemented in further extension. This system is implemented by AHP method and it should be developed from other MCDM method which can give the best decision for the user's preference.

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[1]   Theint Wut Yi Phyo, Thin Lai Lai Thein, "Mobile Learning System for Evaluating English Study Course Based On AHP Technique", Proceedings of National Journal of Parallel and Soft Computing, Volume 01, Issue 01, NJPSC, University of Computer Studies, Yangon, Myanmar, January 2020.

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