A network model for a mobile learning environment to track students' progress

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Abstract: In this paper, we present a model for evaluating the education that is based on a network and an approach to its construction and assessment. The educational model that exhibits quality evaluation has better practicability during common sense application and fully satisfies the test requirements, according to studies, when seen through the lens of school effort partnership. The degree of information that both the students and the teachers possess is a significant in determining the instructional strategies that are utilised for both learning and teaching. The primary focus of attention is directed toward the aspects of the classroom environment that have been recognised as being disruptive. This research has a primary purpose of identifying these elements and offering ways for successfully managing or removing them in order to improve mathematics teaching and learning.

Keywords: learning capacities of students; model for evaluating networks; cloud computing; mobile learning environments.

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1 Introduction

A major step forward in the ongoing reform of education and teaching has been the integration of network technology with contemporary educational technology (Liu et al., 2021b). This is because of how far current information technology has come. Many educators are studying and trying to apply the network's teaching approach, which has also generated heated discussion and investigation among educators. The benefits of both online and conventional classroom learning are brought together in education through networks. This method effectively monitors students' learning processes and motivates teachers to assume leadership positions in the classroom. Conversely, it may foster students' inventive consciousness, encourage them to study independently, and represent the prominent

role that students play in the learning process (Liu et al., 2021c). Many US academics have looked at the network teaching model since it has become an important component of the education reform movement. Based on the various steps taken by network education throughout the years, this project aims to provide a training framework for this type of instruction. To illustrate relevant procedures, for instance, colleges and universities are utilised. This study aims to examine eight traits and their relevance to students' learning adaptability. Among these features are a growth mindset, the ability to study on one's own, classroom management, a solid foundation for learning, a reliable platform for instruction, and a conducive atmosphere for instruction (Liu et al., 2021a).

Improvements to the quality of instruction are in the works as part of a larger initiative to foster potential. All parts of the school education system rely on the quality of instruction, which is the most basic part of the system engineering as a whole. Just as we can think of talent training as information due to its methodical engineering, we can also think of high-quality instruction as an information complex with content. This dataset includes the extent to which educational institutions can satisfy the societal need for talent. Furthermore, this data complex incorporates the data complex pertaining to the demand for abilities within the nation and society. The ideological and moral physical quality, psychological quality, and physical quality of a talent are all parts of this information complex, along with their professional knowledge and skill level (Kong and Ma, 2020; Lv et al., 2020). The goal is to meet the standards set by the public cloud service. As a whole, cloud computing has helped a lot of companies, fixed a lot of problems, and followed the one, flawless rule for all kinds of applications. The expansion of cloud computing has made this possible. This goal has been accomplished by the steady improvement of cloud computing. This is shown quite clearly in Figure 1.

There are three levels that make up the platform in its most fundamental form. These layers include resource pools, management middleware, and service-oriented architectural building architecture. The development layer of service-oriented architecture (SOA) includes a variety of components, including service interfaces, registration, searches, access, and processes (Zhu et al., 2020). With this in mind, the basic idea of cloud computing started to emerge: users initiate a request for a cloud computing directory module through the user-cloud interface, and then the management of the cloud system begins to verify the request, process it, and allocate the available resources to the user. Particularly crucial is the fact that cloud computing makes it feasible for customers to get a proper operating system by means of associated configuration tools (Sindhu et al., 2019). Because the actions that each function is responsible for have an effect on the overall design and administration of the platform, each function has a specific purpose that it must fulfil. By utilising network education tools, users are provided access to secret material kept in the cloud (Lin et al., 2019). The utilisation, allocation, and management of all of the computer's information resources are the responsibility of system management. Its principal goal is to maximise the utilisation of the system management module's core value. Almost any program needs a configuration tool, and that tool's main job is to set up the environment where all the important parts are running (Zhang and Shi, 2019). Aside from checking the regular operation of each module, it also finds out how often each function node is used. As far as cloud computing development is concerned, it is a relatively new technology. The query service directory, which is accessible within the mobile cloud environment, is used to process user requests for cloud services. Users have access to a wealth of information resources through the cloud, which allows them to download and install software and perform query statements (Abdelhadi and Nurunnabi, 2019; Dong et al., 2019). The many parts that comprise the school entrepreneurial partnership framework are shown in Figure 2.

Figure 1 Framework for managing the quality of education

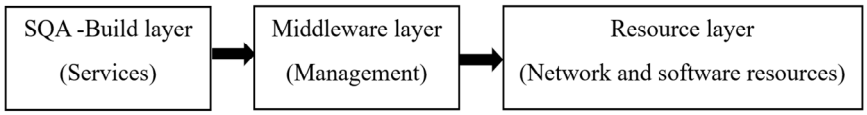
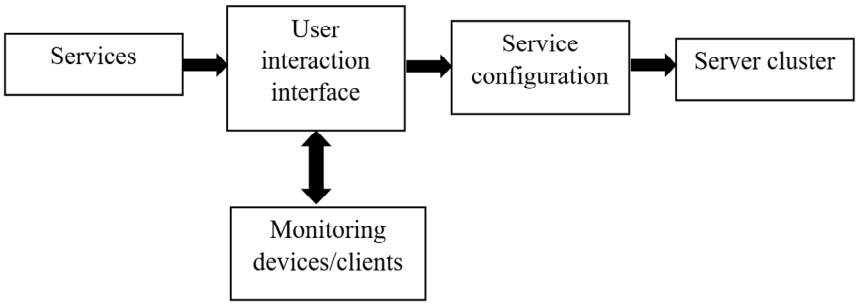


Figure 2 Principles of operation for educational information management



2 Model for assessing the efficacy of education in online networks

Contrarily, there are still several issues with the mobile learning platform that must be resolved. E-learning depends on network resources, yet many of those resources are already at capacity and cannot provide any usable data. Students can only have a cursory understanding of the subject, and a lot of valuable information is wasted as a result. No one, not even the best educators, can possibly meet the needs of every single student (Jian, 2019). In a typical setting, it is also quite challenging to achieve. Although current learning resources are not up-to-date, there are not enough typical learning instances, and students' uneven skill levels greatly impact their ability to absorb new information. There is no way to give students quick feedback on their progress because there is no learning evaluation model throughout the learning mode, and the knowledge system is not organised. The teachers are free to state their opinions on where something is located. Students could acquire disorganised and perplexed thought patterns as a result of learning that is not cohesive (Lin et al., 2021). With the help of e-learning, the current learning environment has been much improved, and a new one has been created that is unaffected by the passage of time. Both students' ability to learn and their desire to study are enhanced by the location limits to which they are subject. Further benefits of cloud learning include students' ability to collaborate, take on several roles, access material quickly, and make full use of accessible resources (Fatani, 2020; Choudhury and Daly, 2019). Take note that there is coherence in the construction of the internal structure module and the guidance strategy.

The content of the instruction consists of three parts: well-organised and precise teaching material; clear and sufficient reasoning; and regular question and answer sessions, as well as meticulous assignment organisation and correction. Relevant examples, a wealth of information, content that is both smart and substantive, and a firm grasp of reality are all crucial. Teaching preparation consists of three parts:

1 researching the subject thoroughly

2 reading professional works and reference materials on the subject and teaching methods in a systematic manner

3 familiarising oneself with the syllabus and learning objectives

4 designing electronic courseware with pictures and texts in a clear and concise manner.

Adaptable pedagogical practices, easily understandable lectures, and the capacity to direct and inspire optimistic thought in students are the three pillars upon which effective teaching approaches rest. It is recommended to employ open teaching and make smart use of new supplementary teaching approaches to encourage students' innovative abilities (Litke et al., 2021). Furthermore, it is critical to guide students in developing positive learning habits and altering their perspective on learning. Teaching management, course material, preparation, fundamental teaching abilities, methodologies, teaching, and educating people are all areas that can be improved through peer assessments.

Because of this shift in focus, we must remember that the emphasis in schools has always been on the teacher. Students play a pivotal role in their own education and teachers play a key role in facilitating their progress through the curriculum. When it comes to the present status of curriculum instruction, students know best and can make the biggest difference. The quality of the information that teachers transfer through their curriculum is most directly reflected in the learning effect and students' level of knowledge mastery (Mbise, 2021). The goal of doing student evaluations once every semester is to make sure that every teacher gets a chance to be assessed. The office of academic affairs arranges for the students in each class to rate their teachers depending on the class. In addition, the office provides students with directions on how to complete the form in an honest and accurate way. Student evaluations cover topics such as instructional efficacy, course content, teaching attitude, and strategies of reaching out to students.

When it comes to performance assessment, the objectives include assisting students in developing their abilities as performers, increasing the bar for their own work, reducing the amount of work they have to do, promoting deeper knowledge, and polishing their analytical and problem-solving skills. For the purpose of determining the quality of the program, we need to use a method that is rational, impartial, and straightforward. It is better to achieve unity by the application of philosophy, logic, and common sense rather than relying on conjecture or an individual's subjective emotions (Fauth et al., 2021). There are commonly four methods that educational institutions, such as schools and universities, use to evaluate the performance of their students.

2.1 Implementation of evaluating the quality of courses

The development of the system is made easier by the design of the functional structure, and the assessment system is gaining more and more popularity owing to the expanding maturity of the technology behind the internet. The method of evaluation is also quite straightforward when seen from the point of view of partnerships between educational institutions.

We should begin by performing further study on the learning environment, assessment method, and design by means of demand analysis in order to develop a learning evaluation platform that is more suitable. This will allow us to establish a platform that facilitates learning evaluations. Following that, we need to construct a learning assessment platform that is more suited by means of the investigation of restrictions. The use of a BP neural network technology is employed in the process of conducting the research of the

limitations, and the outcomes are then included into the demand analysis approach. Due to the fact that the BP neural network approach is based on the concept of back propagation, it is able to make modifications to the fork value and threshold in real time depending on the input and output in order to get the best possible conclusion. To put it another way, the average of the squares of the mistakes that are the least. The use of this technology results in an increase in the precision of demand analysis as a consequence of this issue.

The presentation layer receives information or material that is to be assessed from either the instructors or the students. This is accomplished via the use of mobile terminal equipment that is a component of the communication network channel. Afterwards, the data is processed in a manner that is consistent with the function that is designated for each further layer. The last stage in the process of evaluating the quality of mobile learning is the installation of the terminal application on the mobile device. From the perspective of school enterprise collaboration, this phase is based on their perspective.

In mobile learning settings, protecting the data and privacy of students is an issue that is both essential and difficult to overcome. The collection of data should be restricted to information that is directly related to the learning experience, and extraneous personal details should be avoided. This is as vital as it is important. It is possible that we will use robust encryption algorithms in order to safeguard data while it is both in transit (between devices and servers) and while it is kept on servers. Additionally, we apply stringent access restrictions to guarantee that only authorised persons are able to interact with student information. Granular permissions, role-based access, and multi-factor authentication are all included in this category. By using security procedures that are considered to be industry standards, such as conducting regular security audits, patching vulnerabilities, and implementing intrusion detection systems, one may protect themselves from potential cyber attacks. It is essential to find a middle ground between safeguarding the data and privacy of students and providing those students with a learning experience that is both individualised and efficient. Through careful consideration of the aforementioned aspects and the selection of the right data protection measures for your particular setting, it is possible to establish a mobile learning environment that places equal importance on the protection of student privacy and the provision of a quality educational experience.

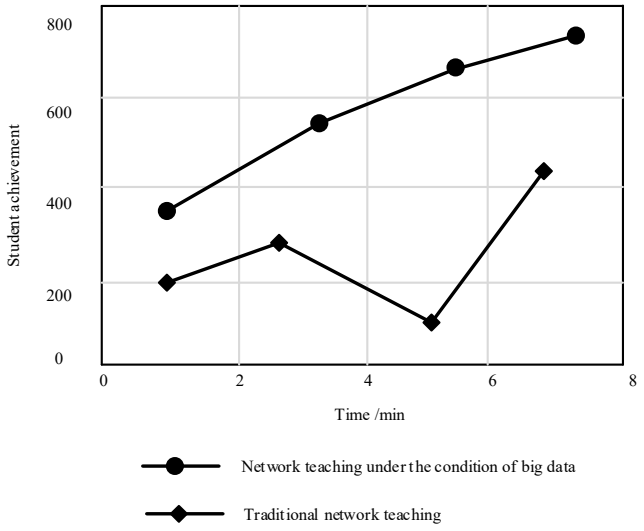
3 Analysis of experimental results

The cloud computing platform that is open-source and free is the one that is selected by the learning quality evaluation system that was developed from the perspective of school enterprise collaboration. The features of learning evaluation management are then implemented for college users. This platform is then utilised to accomplish these functions. The cluster is comprised of a total of five different machines. The master of the name node management node is one of these computers, while the other four are data nodes, which are employed as slave nodes for the purpose of storing data. The master of the name node management node is one of these computers. One of the functions of a variety of terminal applications is to process information, which may include actions such as sending it to other people or devices, temporarily storing it, and other operations of a similar kind. It is difficult to engage in mobile learning when there are no mobile terminal devices available. This is because the advent of mobile terminal devices has sped up the development of the viewpoint of school enterprise cooperation and mobile learning. This is the reason why this is the case. The development of personal computer technology has also led to an increase in the level of innovation that can be found in mobile terminals. The mobile gadgets that are accessible to consumers nowadays come in a wide variety of options.

Cloud deployment needs to assign different roles (technical roles) include generation of learning resources, resource transfer, result feedback, information modelling, information processing, management knowledge, communication platform and information sharing.

Figure 3 illustrates, network distance teaching in the context of big data has the potential to not only improve students' performance but also save them time. This is especially beneficial for students who are unable to answer questions about their homework at home in a timely manner. There is a value range of [0, 9] that has been established for the evaluation indicators. As part of the evaluation process, leaders and experts will do a detailed evaluation of the worth of peers after attending many lectures.

Figure 3 Comparison of network teaching and traditional network teaching



4 Statistical analysis

The results of the KMO test were 0.823, whereas the Bartlett test yielded 0.010. It has been determined, as can be

seen in Table 1, that the data are appropriate for the detection of the structure.

Table 1 KMO and Bartlett's test

Kaiser-Meyer-Olkin (measure of sampling adequacy)	0.823
Bartlett's test (sphericity approx. chi-square)	0.010
Degree of freedom	15
Variance	0.10

Given that the value of KMO in this scenario is 0.823, it can be deduced that a factor analysis would be beneficial to employ with this data. The value of the Bartlett test, on the other hand, is lower than 0.5, which shows that the variables are related to one another and are appropriate for the analysis of structure.

Confirmatory component analysis, abbreviated as CFA, is a specialised kind of component analysis that is also utilised in social research (Thommen et al., 2021; Kemp et al., 2019; Venkatesh et al., 2012; Ahmad et al., 2020; Alqahtani and Rajkhan, 2020; Sargent et al., 2012). It places an emphasis on the measurements that the researcher employs to measure in order to fully comprehend the nature of the construct. It is beneficial to perform an analysis of the research's hypothesis and to concentrate one's attention primarily on the research's number elements. In this section, the components, initial eigenvalues, and the extraction of the sum for the squared loadings are discussed. The total number of components is six, and it does an analysis of both the cumulative percent of the major components as well as the percentage of variance. Those are the eigenvalues considered to be initialled in the model. In addition to this, it performs an analysis of the cumulative %, which reveals that the percentages for all four factor components. There are two components that make up the extraction sums of squared loadings.

The percentage of variance column provides a visual representation of the total variance percentage that can be attributed to each factor. According to the findings of another analysis, the four factor components combined accounted total aggregate variation.

Table 2 Variance w.r.t different components

	Initial eigenvalues			*Extraction sums of squared loadings*		
	Total	*% of variance*	*Cumulative %*	*Total*	*% of variance*	*Cumulative %*
Component (degree of freedom 10)						
1	4.242	42.419	42.419	4.242	42.419	42.419
2	1.238	12.381	54.801	1.238	12.381	54.801
3	1.093	10.931	65.732	1.093	10.931	65.732
4	0.889	8.891	74.622	2.659	44.312	44.312
Component (degree of freedom 5)						
Teaching method	0.803	8.030	82.653	1.185	19.747	64.060
Behavioural alteration in students	0.486	4.864	87.517	4.508	45.083	45.083
Attitude of students	0.405	4.049	91.566	1.316	13.159	58.243
Effective collaborative relationship	0.340	3.404	94.971	1.162	11.618	69.861

Table 3 Factor based component analysis when degree of freedom is 10

	Component			
	Teaching method	*Behavioural alteration in students*	*Attitude of students*	*Effective collaborative relationship*
Educational techniques professionalism	0.568	0.138	0.428	0.134
Attitude	0.714	0.362	0.171	0.351
Efficacy in practice	0.670	0.068	0.064	0.066
Connection to method	0.720	–0.442	–0.196	–0.429
Framework	0.814	–0.203	–0.122	0.197
Defective negative perception	0.047	0.835	–0.029	0.810
A collaborative relationship	0.794	0.037	–0.304	0.036
Modifications in behaviour	0.770	–0.024	–0.342	–0.023
Student attitude	0.733	0.134	0.335	0.130
Marital status	0.132	–0.360	0.708	–0.349

Table 4 Factor based component analysis when degree of freedom is 5

	Component			
	Teaching method	*Behavioural alteration in students*	*Attitude of students*	*Effective collaborative relationship*
Educational techniques professionalism	0.208	0.694	0.010	0.214
Attitude	0.418	0.633	0.309	0.431
Efficacy in practice	0.500	0.450	0.065	0.515
Connection to method	0.787	0.149	–0.332	0.811
Framework	0.774	0.320	–0.127	0.798
Defective negative perception	–0.121	0.211	0.801	0.125
A collaborative relationship	0.805	0.226	0.158	0.830
Modifications in behaviour	0.818	0.168	0.112	0.843
Student attitude	0.394	0.715	0.042	0.406
Marital status	–0.194	0.540	–0.565	–0.200

The overall variation principal component analysis is the extraction method that has been used. There are a total of ten components, and an analysis is performed on the % of initial eigenvalues and extraction sums of squared loadings for the principal components. Those are the eigenvalues considered to be initialled in the model. In addition to this, it performs an analysis of the cumulative %, which computes that the percentages for all four components the number of factors that were included in the variable analysis corresponds exactly to the number of original components. The percentage of variations is reflected in Table 2, and it has been observed that in certain instances this percentage is higher than 30. In general, a value of 10 is considered to be a good value, while a value between 20 and 30 is considered to be acceptable. The values higher than 30 are not allowed in this context. As a result, it has become abundantly evident that the value of factor component 1 cannot be tolerated. The sum of all of the percentages for all of the regions, starting at the top of the table and working its way down to the bottom, equals the cumulative value. The factors of this analysis are suitably sorted according to this proportion, which was provided earlier. Only three of the original factor components are kept in the final product. As the process of conducting factor analysis is carried out in the correlation matrix, the initial eigenvalues represent the factor variances. On the other hand, according to the standardised variables, it has been shown that the variance value of each variable is 1. In this particular instance, the total variance is 10, reflecting the fact that there are a total of ten components.

4.1 Matrix of components: principal component analysis

The relationship between the variables and the components is shown here by the component loadings, which are shown in Table 3. Several values have been gathered in order to establish the nature of the connection that exists between the variables and the components (Ergüzen et al., 2021; Al-Shihi et al., 2018; Alshurideh et al., 2023). The numbers range from –1 to +1, and any deviation from that value shows an inaccuracy in the measuring process when attempting to establish a correlation. The value –1 is used to represent a perfect negative correlation, while the value 1 is used to represent a perfect positive correlation. The data presented in Table 4 that can be found above indicate that there is a strong relationship between the variable teaching technique and the components 1, 2 and 3. A statistically significant inverse connection was found between the independent variable collaborative relationship and both components 2 and 3.

It has been shown that there is a strong correlation between the variable attitude of students and the third factor component. However, it has also been observed that the value of this variable's correlation with the other components is lower than that of the other components. After that, a significant amount of correlation may be shown between the initial component and the beneficial collaborative relationship. After that, there is a strong correlation between the third component and the characteristic known as negative perception failure. As a result of this exam, it is now abundantly evident that the focus of this research ought to be on the students' attitudes, collaborative relationships, and unsuccessful attempts at negative perception.

5 Discussion

There is a measurement known as the KMO test that is used to determine whether or not the data that are being analysed are appropriate for factor analysis. The purpose of this test is to ascertain whether or not sufficient sampling was carried out for each variable in a model, as well as for the model as a whole (Alshurideh et al., 2023). The field of study known as statistics is concerned with the proportionate distribution of variance among variables that have a common variance. The adequacy value of this test is between 0.8 and 1, and a figure that is less than 0.6 shows that the value is inadequate, indicating that corrective action is required. The adequacy value falls between 0.8 and 1.

For the purpose of determining whether or not the variance is comparable across all of the categories in relation to the variations, the Bartlett type test is used. In addition to this, it investigates the variables to ascertain whether or not there is any particular duplication among them, such as when a number of different factors might be utilised to describe the same item for example (Lin et al., 2021). A sample is said to have a homogenous variance if and only if all of its variances are distributed in a manner that is comparable to one another. The fundamental assumption that underpins variance analysis is that it is reasonable to anticipate that all of the samples or groups that are being considered will produce the same outcomes. In order to ascertain whether or not the assumption that was presented before is accurate, this Bartlett test will be carried out. It is acceptable to think that the value of a specific factor analysis will be beneficial when the Bartlett value shows a high result that is extremely near to 1. However, this is not always the case. Because of this, the Bartlett value is getting closer and closer to 1 with a great deal of accuracy. If, on the other hand, the result of the test reveals that it is less than 0.50, then the tube factor analysis is not going to be all that helpful for the research process.

The statistical technique known as confirmatory factor analysis (CFA) is used in order to verify the composition of the factors that underlie a collection of different variables. This is accomplished by using the approach. For the purpose of determining whether or not the variables in question are present, this approach is often used. In accordance with the perspective that is offered in Ergüzen et al. (2021), it makes it possible to test hypotheses about the links that exist between the variables that have been specified and the latent underlying constructs that are already present in the system. It has been determined that the value of 0.05 is acceptable, and the range of values that are acceptable for this value is between 0.05 and 0.08. On the other hand, the value range that runs from 0.08 to 0.1 is referred to as the marginal value (Al-Shihi et al., 2018). It is widely believed that values that are greater than 0.1 are of not very good quality.

The pattern of school training and exhibiting change is expected to be the organisation's displaying method, since this is what is anticipated. As a result of this transformation, the use of modern organisation innovation will continue to increase and become more prevalent, which will, to some extent, help the general development of education and teaching. Therefore, in order to make the assessment more in line with the real conditions of organisation education, the quality evaluation of organisation education need to be based on the criteria of organisation learning environment and educational program features. This will ensure that the evaluation is more accurate. As an additional step, the quality assessment model of organisation education has to be disassembled and created, and the evaluation pointers that are related to it need to be identified.

6 Conclusions

In order to enhance the capabilities of the students, the teaching staff needs to put in the effort to build an educational structure that is suitable. This research has provided a comprehensive illustration of the techniques that were utilised in the process of carrying out this research. Because of this study, the statistical analysis of the survey results has been brought into greater clarity. An investigation into the effects of a number of factors was the primary objective of this study. These factors included, but were not limited to, instructional strategies, basic concept comprehension in relation to mathematics, attention deficit hyperactivity disorder, the ability to represent concepts by making use of previously acquired information on subject and method, and the absence of touch and practice. The findings of the paper indicate that both the instructors and the students are in agreement that the aforementioned elements have a substantial influence on the education that is provided at the institution. This conclusion was reached as a consequence of the findings of the survey. Another factor that contributes to the increasing number of challenges that students are encountering in the process of developing their mathematical abilities has been proven via the investigation of the incorrect teaching style, which has also been shown to be a contributing factor. A lack of touch and practice throughout the process is one of the most major hurdles that stands in the way of the successful operation of the learning and teaching process. This limitation is one of the most significant difficulties. An impact known as a trickle-down has taken place, which indicates that the gloomy temperament of the pupils has also had an influence on the educational method. The variables that were taken into account during the whole of this investigation will serve as the focal point of the aims of this study in the years to come. In addition to this, a broad range of learning styles will be investigated in order to get an understanding of the benefits and relevance of each specific kind of learning style. The last phase of this research project will consist of providing an in-depth examination of the many ways in which the collaborative learning style has an impact on the final result.

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