SMART CAMPUS: AN IMPLEMENTATION OF A CLOUD-BASED MOBILE LEARNING APPLICATION

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ABSTRACT

A cloud-based mobile learning application allows access to learning resources stored in the cloud. The limitations of the traditional mobile learning such as insufficient storage, limited power have made mobile learning applications inefficient, hence the need to integrate mobile learning with cloud computing. This paper focuses on providing a smart platform where instructors or lecturers can upload learning resources to the cloud, and learners can access these resources with their mobile devices, after they have been successfully uploaded. Also the concepts, technologies, and tools used for the implementation were also discussed.

Contribution/Originality: This paper contributes a smart campus initiative using the concepts of Cloud Computing and Mobile Learning.

1. INTRODUCTION

New strategies and approaches have evolved in the education sector, particularly in terms of teaching and learning. These approaches have raised a lot of interests, in the educational institutions in order to enhance learning. Some of these new technologies are cloud computing and mobile learning which have given rise to cloud-based mobile education.

Cloud computing is a technology that involves the storage of data and other computing resources over the Internet. These resources, which may be files, audios, videos, and so on, can be stored and retrieved from the "Cloud"- a virtual pool where information can be stored and accessed when needed (Han and Abdullah, 2012; Minjuan *et al.*, 2014). Mobile learning is learning with mobile devices. It allows learners to access learning resources anywhere and anytime via portable devices by harnessing the smart capabilities of the devices. Mobile learning systems are built using the technology of mobile computing. Mobile computing opens a fast, easy, and innovative way of learning to learners. Mobile learning refers to the use of mobile and handheld devices such as Personal Digital Assistants (PDAs), mobile phones, laptops and tablet PC technologies, in teaching and learning (Mohana and Vijayalakshmi, 2011; Rao *et al.*, 2012). Mobile learning involves storing information on mobile devices, which is quite difficult to achieve due to the limited storage space of the devices. Though the proliferation of mobile devices have given rise to its increased usage in education, but considering the size of educational

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resources and learning materials, it is becoming quite difficult to achieve maximum storage of these materials due to the limited storage space of the physical storage devices thus Cloud-based education has become popular in providing a platform, where educational materials can be stored; uploaded and downloaded by the learners using their mobile devices. The implementation of cloud-based learning using mobile devices is known as Cloud based mobile learning. Cloud computing and mobile learning paradigms are combined to improve mobile learning applications that enable learning anywhere and anytime. Cloud-based mobile learning applications provide both teachers and students ubiquitous means of storing and accessing numerous learning resources. It also permits the offline download of learning resources from the cloud storage to a student's mobile device. Cloud-based mobile learning provides a platform that proffers a solution to the problem of delay in the accessing of learning resources caused by poor or slow network transmission associated with mobile learning. The low processing power of mobile devices has limited the operation and applicability of mobile learning. There has also been degradation in the powering of mobile devices as the lifespan of the batteries of mobile devices keep reducing upon continuous usage or aging. It could be very frustrating when a mobile device goes off when an important online learning activity is ongoing. The implementation of a cloud-based mobile learning application is targeted at providing a cloud platform where students can receive live lectures, download course materials, and collaborate with other students. The advantages of cloud computing such as less cost, easy and fast access to learning resources, massive data storage, and high-performance computing can be used to overcome the limitations of the traditional mobile learning.

2. RELATED WORKS

Benjamin (2011) implemented the international icampus. The icampus initiative was aimed at creating a holistic next-generation intelligent campus environment that is suited for the 21st century. A number of pillars have been defined in the iCampus framework, namely the iLearning, iSocial, iGreen, iHealth, iManagement, and iGovernance aspect of the campus.

Mohana and Vijayalakshmi (2011) developed an interactive live mobile learning system, which streams live lectures to students' mobile devices with interacting facilities, using a mixture of existing and self-developed codec's. The application supported mobile learning and delivery of learning materials at anytime and anywhere by playing lectures and tutorials through the use of J2ME Mobile Media. Boyinbode and Akintade (2015) reported the design and development of a user friendly interface for cloud based mobile learning that allows learners to access the cloud anywhere and at any time with their mobile devices, which provides a sort of supplement to the traditional learning for students of higher educational institutions of Africa, in scenarios where students cannot afford to buy text books. Aleksandar and Danco (2013) proposed a PaaS cloud-based framework, which offloads the process of dynamically adapting the multimedia content to the context-aware mobile learning environment, the student was provided with multimedia that is tailored to his or her cognitive style and the content was adapted according to context aware network conditions. All the requests from the student's mobile device were sent to the mobile cloud and the response was appropriate multimedia content. Afolabi (2014) designed a mobile learning system based within the context of mobile cloud computing. A mobile website was developed as well as a mobile application which gathered relevant information in relation to the individuals' topic of interest from a database located on a remote server and also web-links gotten from the cloud to expand the knowledge and understanding of the individual in the area of interest. All these works implemented cloud based mobile application but did not integrate the social component, which allow collaboration and sharing of learning resources among learners, hence enhancing and improving their learning.

3. METHODOLOGY

This cloud-based mobile learning application was implemented using an Android platform, a cloud storage (a Software as a Service cloud model), and Internet connectivity to ensure communication. The Android application is

installed on both the student's and staff's mobile devices. This Android platform provides an interface that allows a registered student to access the learning resources uploaded by the Lecturer of the University. The Lecturer uploads learning resources like live lectures, course materials, course registration forms, and so on, to the cloud via Internet connection. The students can then download and save these resources on their mobile devices from the cloud via Internet connection. Students can also upload educational questions to the cloud where other students can access the questions and provide solution to the questions (Hong-qing Gao, 2010). The application was designed to support collaborative learning and create a platform that connects all students in an academic institution together. Figure1 shows the architecture of the Cloud based mobile learning.
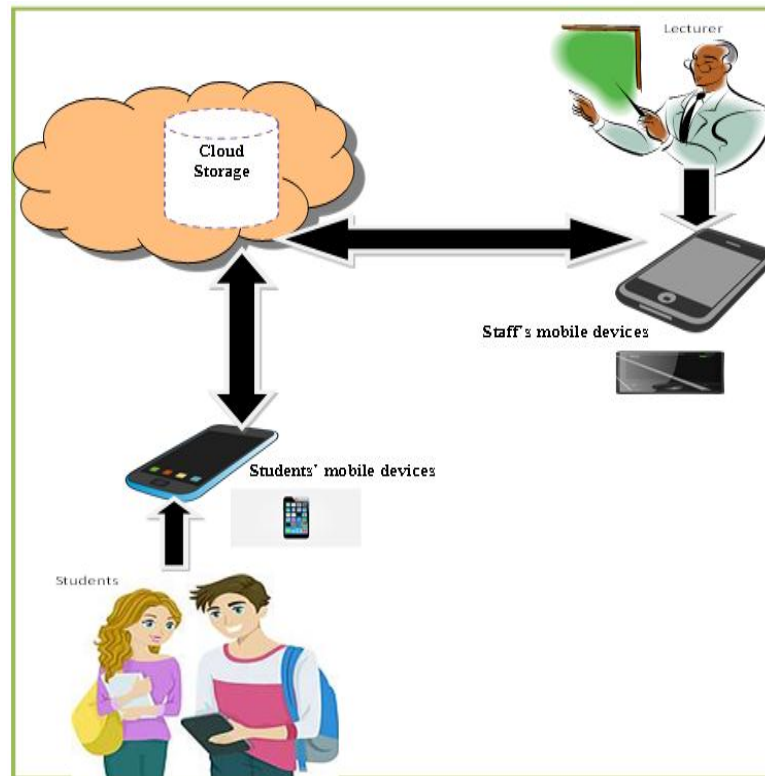

Fig-1. Archictecture of Cloud Based Mobile Learning

A. System Implementation

This application was implemented for two categories of users: the students and the staff. The views for each category of users are represented on the Home Page (as shown in figure 2). where Users can choose the category of user they belong to. Both the staff's view and the student's view have Registration Page, Login Page, and Reset Password Page interfaces. The Staff's view has the following interfaces: Course material upoad page, Lecture upload page, Result upload page, Events Notification page and health tips upload page.On the other hand, the student's view has the following interfaces: Learning page, Social Page, Health Page, Course material page, Lecture page, Result page, Uniconnect page, Campus Event page and Health tips page.
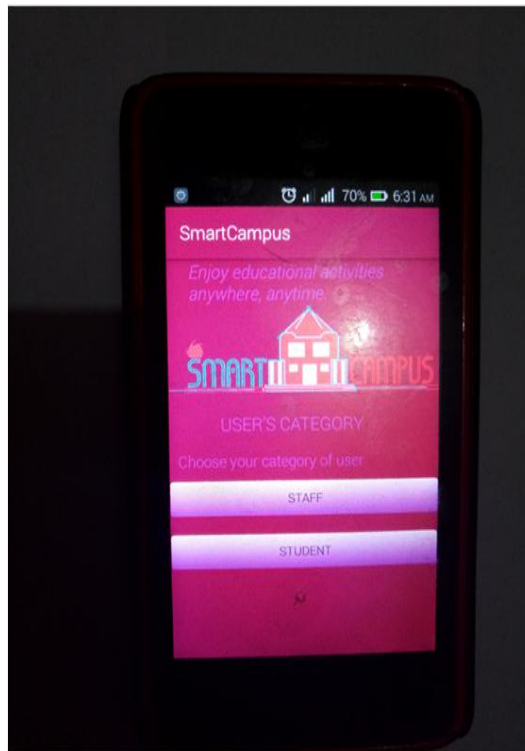
Fig-2. An Image of the Home Page

1. **Registration Page**

The registration page allows both staff and student users to register their details upon their first usage of the application. Hence, registration is one-time activity. This page has separate views for the two categories of users. The staff registration page comprises five input boxes and a button. The input boxes are for full name, phone no, email address, password and confirm password respectively. The button submits the user's inputs. The student registration page comprises of six input boxes and a button. The input boxes are for full name, department, level, matriculation number, password and confirm password respectively. The button submits the user's inputs. Figure 3 and Figure 4 show the interfaces of the registration page.
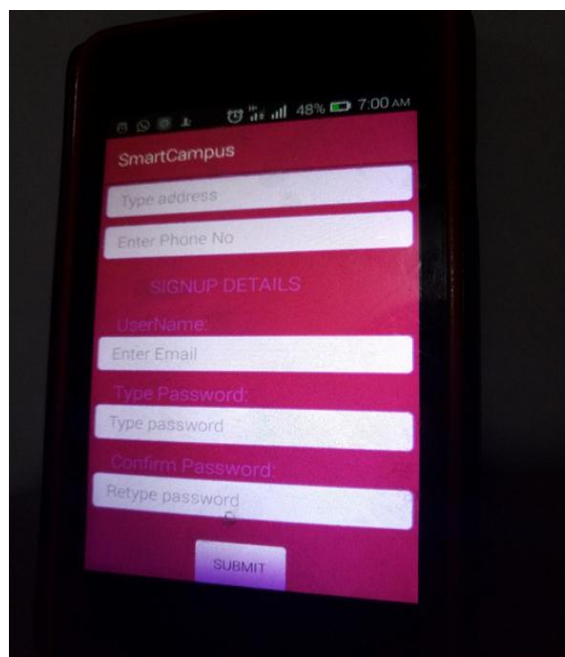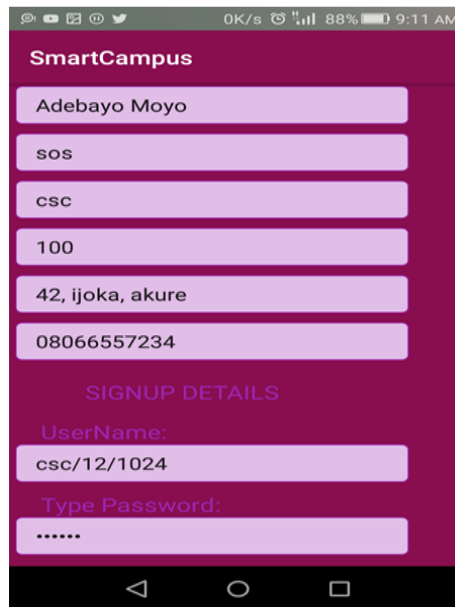

Fig-3. An Image of the Staff Registration Page

Fig-4. An Image of the Student Registration Page when Filled

2. Login Page

A user needs to login with his/her already registered details before he/she can gain access to the features of the application. The login page is an interface that allows users to be authenticated after successfully matching the already registered details with the current inputs the user supplies. A student is required to login with his/her matric number and password while a staff is required to login with his/her email address and password.The interfaces of the login page are shown in figure 5 and figure 6.
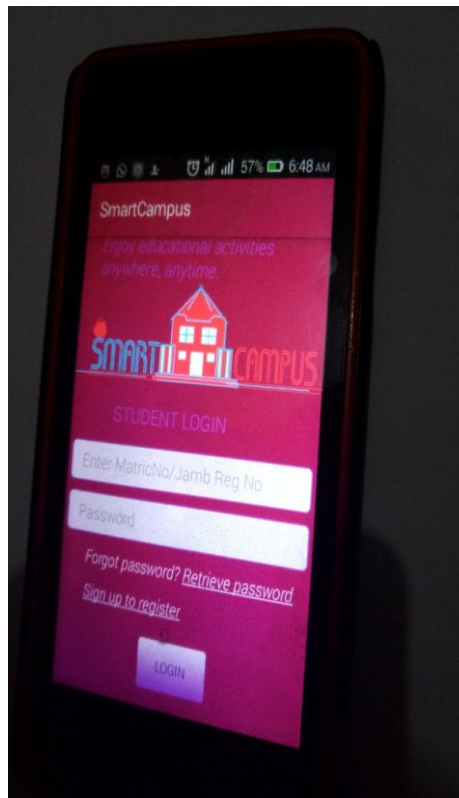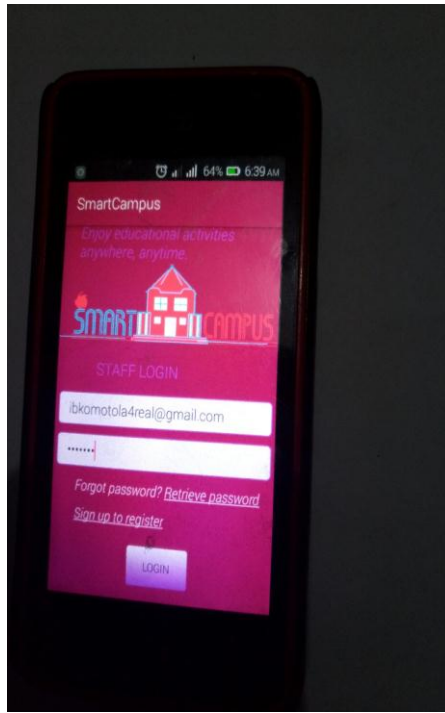

Fig-5. The Student Login Page

Figure-6. The Staff Login Page when Filled

3. Reset Password Page

This page allows a registered user to reset password whenever he/she forgets his/her password or wishes to change it. A link to reset the password is sent to the email address inputted by the user on this page.

4. Course Material Upload Page

The staff uploads files(pdfs, audios, videos) of course materials to the cloud, so that students can have access to the files. These files, can be chosen from the staff's mobile device by clicking the 'choose file' button and then upload to the cloud by clicking the 'upload file' button. Figure 7 shows the course material upload page.
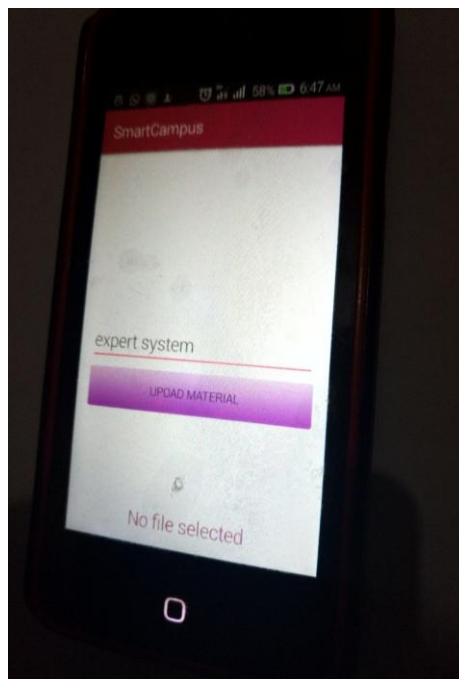

Figure-7. The Course Material Upload Page

5. Lecture Upload Page

On this page, the staff lecture/tutorial videos and are stored in the cloud for easy and immediate access by registered students. Recorded Lecture videos can be chosen from the staff's mobile device and then uploaded to the cloud by clicking the 'upload video' button. In the case where an upload fails, the user is prompted about the error and has to reload the file. Figure 8 shows an image of the Lecture upload Page.
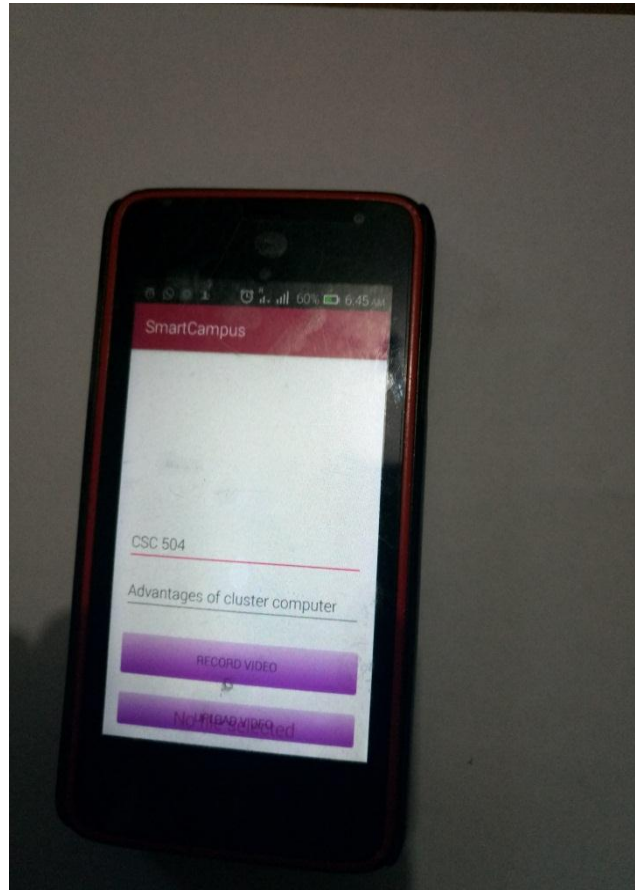

Figure-8. The Lecture UploadP age when Filled

6. Result Upload Page

Here, the staff uploads files containing students' results to the cloud storage where the students can access the files and check their results. These files, which are pdf files, can be choosen from the staff's mobile device by clicking the 'choose file' button and then uploaded to the cloud storage by clicking the 'upload file' button.

7. Event Notification Page

This page allows staff users to add upcoming events on campus or the institution community. The added events are stored in the cloud to create awareness of the events to students on the application. Information like title, time, venue and date of events are supplied and submitted on this page.

8. Learning Page

The learning page presents all the learning activities that a student user can access on the application. It comprises buttons registered to represent each of these activities. The activities include: course material, lectures, and result. Each button takes the user to the next appropriate page depending on the activity chosen. Figure 9 shows image of the learning page.
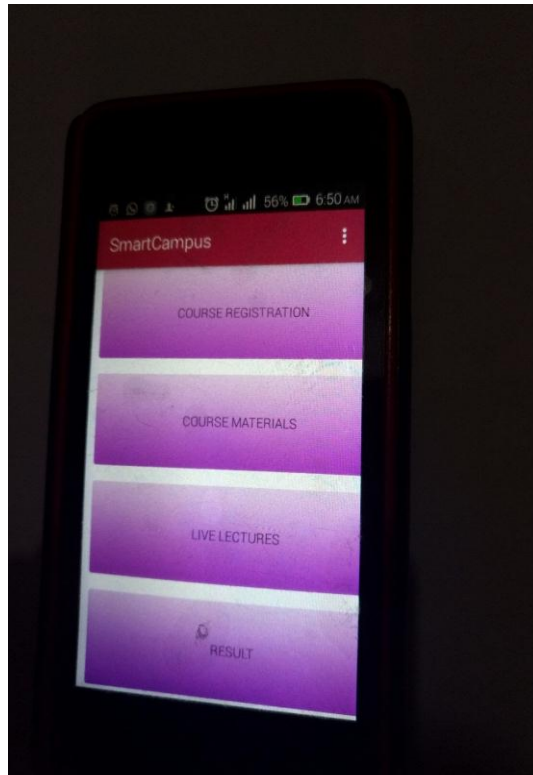
Figure-9. An Image of the Learning Page

9. Social Page

The social page presents all the social activities that a student user can access on the application. The activities are the uniconnect, social groups and the campus events. Each button takes the user to the next appropriate page depending on the activity chosen. Figure 10 shows the Image of the Social Page.
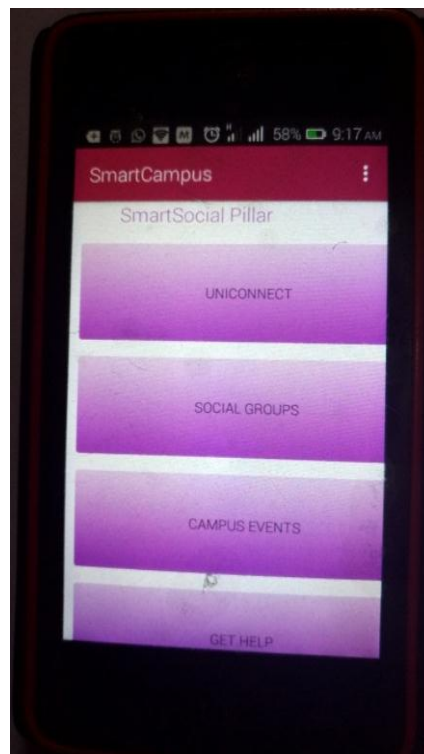

Figure-10. An Image of the Social Page

10. Course Material Page

A list of uploaded course materials by the staff to the cloud storage is shown on this page. Registered students on this application can download these course materials from the cloud over internet connection. Figure 11 shows the image of the course material page.
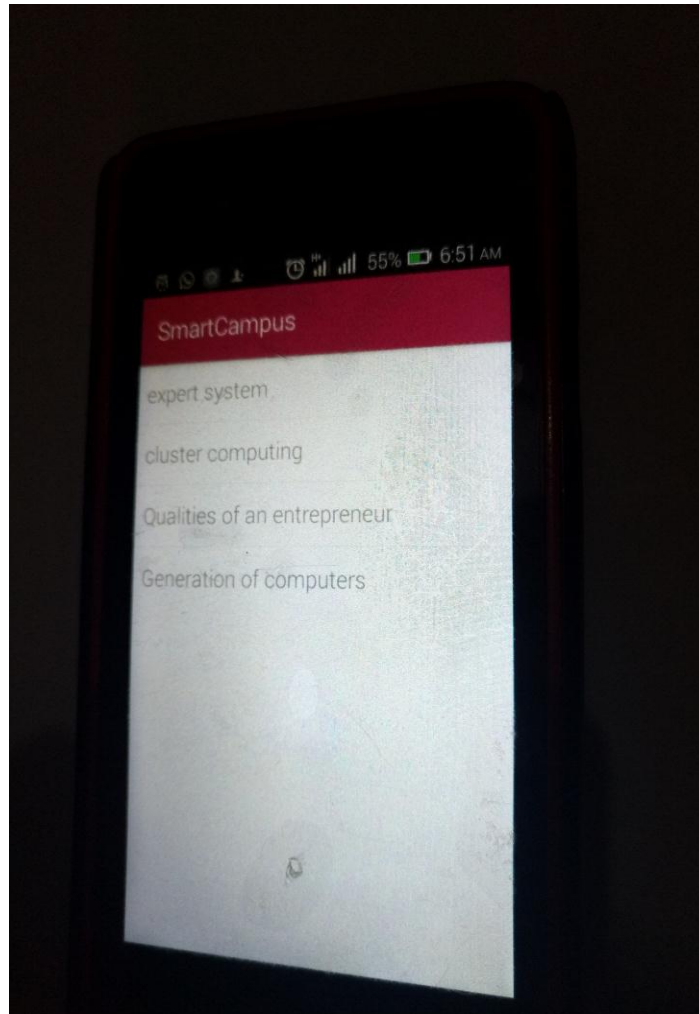

Figure-11. The Course Material Uploaded

4. CONCLUSION

The implementation of a smart campus in form of a cloud-based mobile learning application has made access to learning resources easier and faster to students and also made convenient for the lecturers.It include a social page that allows students to collaborate, share ideas and chat with one another, which is germane in reinforcing student's learning.

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