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Improving Sustainable Development with a Mentorship System to enhance Teaching and Learning for Universities in Developing Countries

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Abstract: Mentorship is an important aspect of helping studetnts to improve in their academic perfomance. Most students are improving when they get mentorship and this help them finish their qualifiaction on time. Some of the student are not aware of the mentorship that is provided in the university, even better some are scared to approach a mentor physically. Said issues should be tackled in order to help students in need of support on certain subjects which will help the university to reach one of it's objective. Even then, booking for mentors is not straightforward and easy. Imagine having to fill out a paper each time one seeks mentorship from one of the mentors at the university. Currently the university uses a file system which requires that mentors and students need to fill forms to make appointments and this cost university as papers are wasted and hard to manage if they are lot of them. Such process is boring and tiring, and most importantly not in line with the goals of sustainable development. Furthermore, the university will have to generate their mentorship reports manually by going through all the papers that was filled by students and submitted by mentor. This study shows that mentorship is a critical factor in the performance of students. Most of the student are depending on mentorship to pass their modules and fulfill the requirements to obtain their qualification in time. A survey was initiated to see the performance of the students who seek mentorship and those who do not. Students who ask for mentorship have better performance than those who do not. Students need a 24 hour system that will help them manage their appointments (mentorship sessions) even as mentors use such system to make available relevant information and interactions to ease mentorship. The university also need such system to keep track of progresses relating to mentorship. This study aims to adress such problem and implement a system towards better student academinc performance at minimal cost, enhancing productivity and progress towards sustainability. In future evaluation of the system, a questionnaire would be administered across different types of users which include Students, Mentors, and University staff to provide their experience with the system and provide valid feedback. Evaluation of the developed system would be of assistance to the students in their quest for mentorship and to indicate to the students if mentorship is effective in their academic success. Meanwhile, attempts are made to ensure mobile friendliness as students access it even through their smartphones. A help page is provided if a user get stuck and need to know how the application works. The university should invest in this project as it will help cut cost and help with make crical decision in terms of deciding whether to exclude a student. The Mentorship system will bring about conveniency and better decision making by the university. Student could engage with this system as it is accessible from anywhere, so the students can make appointment at their own time. Since most schools provide free wifi access across the campus, assessing the application won't be an issue. And with the change to the use of the system leading to possible better student academinc performance at minimal cost, productivity is enhanced and progress becomes sustainable

Keywords: Collaborative learning, knowledge sharing, mentorship, teaching and learning systems

Introduction

This study focuses on improving sustainable development with the aid of a mentorship system. The planning and developement of mentorship system is vital as this could help students in their academics and to obtain their qualification on time. Students should not find learning hard when they can get help by being mentored by experienced people. Most of the students are afraid to ask for help from their peers or even to consult with lecturers on the chapters they do not understand. This can be caused by several reasons. As a new comer at a university, you may find yourself not knowing a lot of things happening around the campus. Mentorship should be a provided to students who are in need of help to overcome their challenges in their studying journey. The big issue is that most of the students get excluded when they fail a subject more than 3 times, which require them to appeal and sometimes their appeal could not be approved. Then they have to wait for few years to apply again.

This study is guided by the following objectives which are: to determine major problem concerning academic performace in university; to develop and implement a web-based application for students to seek for mentorship; and to investigate the usability of the developed web based application for student's mentorship system.

This system provides a platform for students and mentors to manage their appointments. An administrative accessibility is granted to keep track of all mentors who are active and those who reject their appointments, as well as to see student's academic performance influenced by the mentorship. The system will notify the mentor when an appointment is made through email and detail response to the student by the mentor whether they approve or reject their appointment.

Background of the research problem

Many students are shy to ask questions in a lecture. It might be because they are afraid of being a laughingstock in case they say something wrong, or maybe they think they'll be seen as stupid (being clueless) if they ask question in a lecture. Said issues impact the academic performance of the students in a negative way. Mentorship is provided in many universities, but most are using manual file system, and the downside of this is that a mentee needs to locate the mentor's lab and seek for mentorship from the relevant mentor (only to find out the mentors might not be available). While the file system costs the university a lot of money, there is limited possibilities for tracking of the students' performance or the mentors' activeness.

The research problem statement can then be summarized as follows. Students' academic performance is impacted by not getting a clear view of a specific chapter or even worse the whole subject. This is because of a lack of a more accessible and friendly system of managing the dealings between students and the mentors. The time students spent in lecture classes is not enough there they need help where encounter a challenge on a specific subject. The role of mentorship and appropriate mentorship system can thus no longer be understated.

The purpose of the research is to highlight the importance of mentorship and how the whole process of mentorship can be automated. The proposed automated system is aimed at making life easier for people who will be using the system. Dehinbo (2023) indicate the sustainable development involves attaining good quality of life comparable that that of developed countries. Therefore, successful implementation of the prototype outcome of this study could enable future generations to learn so that their future is not compromised. So doing will move the society towards sustainable development.

This next section discusses the literature review. This is followed by the research design and methodology, system output results, and conclusions.

Literature Review

Many activities have been put forward on web application in today's society. The flexibility and accessibility that comes along with web based applications have made them extremely standard in today's school systems (Yu, Kangas & Brewster, 2003).

The tradition of mentoring began with Mentor, a character in Greek Mythology. As Odysseus, King of Ithaca, prepared to leave for the Trojan Wars he instructed his faithful companion Mentor to remain in Ithaca and to take charge of his son, Telemachus. He was entrusted to teach Telemachus all of the things that would help him to become a great ruler. Mentor served as a teacher, role model, trusted advisor, counsellor and, among many other things, a father figure to Telemachus. This was the beginning of the classic mentoring relationship (Caldwell et al. 1993).

Why mentoring?

Mentorship provide an important aspect of learnig where a student is guided and help on a specific challenge they are facing. During the past two decades mentoring became the dominant form of teacher induction and most of the research on mentoring shows very positive outcomes (Bullough 2012). In the United States, being formally mentored in some way has become a common experience among beginning students. No doubt nearly all beginning students are informally mentored. Twenty three US states fund formal mentoring programs and require all new teachers to participate. Nineteen states made a similar requirement of prospective principals (Bullough, 2012).

Students are at a substantially higher risk of school failure and dropping out; therefore, it becomes imperative to implement and evaluate programs that might be effective in assisting the students to overcome these obstacles. Mentoring programs appear to offer one possible solution to the myriad of problems students face.

Relationship between Mentorship and Academic Performance

"Not everyone so easily and without inspiration express their brilliance, not everyone's gifted the same way. Some people pick up quite easily in life, some are a bit slow before they gain momentum and still others have no idea if they were born to shine in this world. It takes a visionary parent, teachers or a mentor to jump start some youngsters" (Pepe, 2010). A story is told of "Alexander the Great" who became a student of the Greek philosopher Aristotle at age thirteen. Under the mentorship of Aristotle he gained great knowledge in philosophy, medicine and Science. At age twenty, he took the throne of his father King Philip when he (his father) was assassinated. By looking at the life of Alexander the great, one can see the influence of mentorship. His mentor Aristotle had cultivated in him a lot of interest in reading and learning.

Benefits of mentorship system

The mentorship system could be used by the students to make appointments, and used by mentors to manage their appointments and by the university administrators to monitor the activities that could determine how reliable or important mentroship is to students. With that being said the following is a summary of the benefits that this system will bring:

Cost Savings: Currently the university is using a paper based system which is expensive to print paper. This will be an automated system which could be cheap on operations.

Improving the job of a facilitator: The system will generate reports based on how the facilitator prefer the report to be like. This will let the admin to check which mentor is not cancelling most of the appointments and which ones are doing their job.

Time savings: The appointment is made within minutes as most of the student information is already captured when they registered at the university.

Service rendered: It's user-friendly and requires no special software or training

Mentoring models

Lawy and Tedder (2011) identified the fact that there is no best practice model for mentoring. They highlighted that if mentoring systems are to be effective, they need to be flexible and adjustable to the mentees' circumstances and needs. Consequently mentors' training should aim at informing them about the different possible models that could be followed and simultaneously enabling them to identify and choose from each model and combine the elements required in each mentoring case (Kadji-Beltran et al., 2013). As discussed above different models of mentoring are defined by the nature of the collaboration: mentoring could be developmental (developmental or formative model) when it serves formative purposes and focuses on personal and professional development, it is based on confidence, supportive through transitions, profession centred, suitable for all, led by the mentee and places emphasis on networks. Alternatively, mentoring could be performative (performative model) if it serves summative purposes, focuses on judgement and performance, is public, is subject centred, is concerned with standards and is led by the mentor (Lawy & Tedder, 2011; Tedder & Lawy, 2009). Induction programmes are based on the assumption that close observation and support from an experienced teacher can be helpful to new teachers (LoCasale-Crouch & et al., 2012).

Challenges of Mentorship System

Implementation of the system process will take longer as it need to be rigoriously tested. We will look at the general challenges and later on focus on specific challenges in developing economies especially Africa. The identified challenges as revealed by previous research works are Security, Infrastructure, Regulatory and Legal issues and Socio-cultural challenges.

Security: The Security of Information and data is crucial in all Information systems. Information Security is the practices, procedures and technology put in place which ensure that information is safeguarded from

Integrity and Authorisation: Integrity is defined as the accuracy, completeness and validity of information in accordance with business values and expectations (CISM Review Manual, 2006). A student needs to sign in when they want to make an appointment and the system will be integrated with the university database for details of the students.

Availability and Reliability: Availability is ensuring that information systems and data are ready for use when they are needed often expressed as the percentage of time that a system can be used for productive work.

Research Design and Methodology
Overall Research Strategy and Research approach

Positivist research will be used as a research approach of this study because it is more objective. In positivist research, researchers identify themselves and their research as independent. An an example, positivist research is repeatable and it may have dependent and independent variables defined. Conducting a training and gathering of quantifiable data are typical methods used in positivist research. Results are usually quantitatively analysed. Positivist research findings are objectively reported and may be generalised (Bhattacherjee, 2012; March et al., 1995:251; Myers, 2009:284).

So, interpretive research wont be used because it is subjective and is used in research that tries to make sense of phenomena through explanation of people's perceptions, language, shared values and meanings in a dynamic social context. Multiple realities are acknowledged when different groups or cultures are studied. Interpretive researchers are not neutral in the research process and researchers are expected to acknowledge their involvement and influence(Adebesin et al., 2011:310; Bhattacherjee, 2012; Hevner et al., 2010:320; Myers, 2009:284; Oates, 2006).

Prototyping

Prototyping methodology is now as fundamental to software development as it has been to systems development in other fields.The use of prototyping has been developed to the level of being the basis for software development methodologies, such as the Evolutionary Prototyping lifecycle model Sommerville states that the evolutionary prototyping methodology "is now the normal technique used for web-site development and ecommerce applications (Zant, 2005) .

According to ISTQB exam certification (n.d.) "a prototype is an early sample, model, or release of a product built to test a concept or process or to act as a thing to be replicated or learned from. It is a term used in a variety of contexts, including semantics, design, electronics, and software programming". According to ISTQB exam certification (n.d.) illustrated in figure 1, "the prototype is usually not complete systems and many of the details are not built in the prototype. The goal is to provide a system with overall functionality.

Diagram of Prototype model:

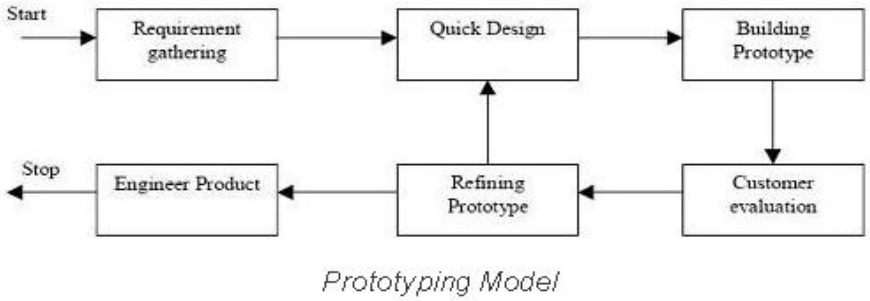

Fig. 1. Prototyping model Source: ISTQB exam certification (n.d.)

Advantages of prototype model:

- Users are actively involved in the development tasks
- Since in this methodology a working model of the system is provided, the users get a better understanding of the system being developed.
- Errors can be detected much earlier.
- Quicker user feedback is available leading to better solutions.
- Missing functionality can be identified easily.
- Confusing or difficult functions can be identified and rectified
- Requirements validation, Quick implementation of, incomplete, but functional, application.

System tools:

PHP, Javascript, Ajax, JQuery, CSS, Bootstrap and HTML will be required to develop the mentorship system. MYSQL Database will be used to store the data. PHP will run in the server to serve that communication between database and the front end of the system.

System architecture

The mentorship system will allow the students to login into the stystem and make make appointment. The notification will be sent via email. The proposed system would provide students, and mentors the necessary platform to create and manage appointments. It would as such, provide a comprehensive structure of data storage. This would be enabling the facilitator:

(1) To actively track users' active use of the system;
(2) Monitor the impact mentorship has had on students' academic performances;
(3) Provide a tools and functionalities required to demonstrate and report issues, or pain points that exist within modules.The comment and enquiry form will be added on the system for students to raise their comments online for our attention.

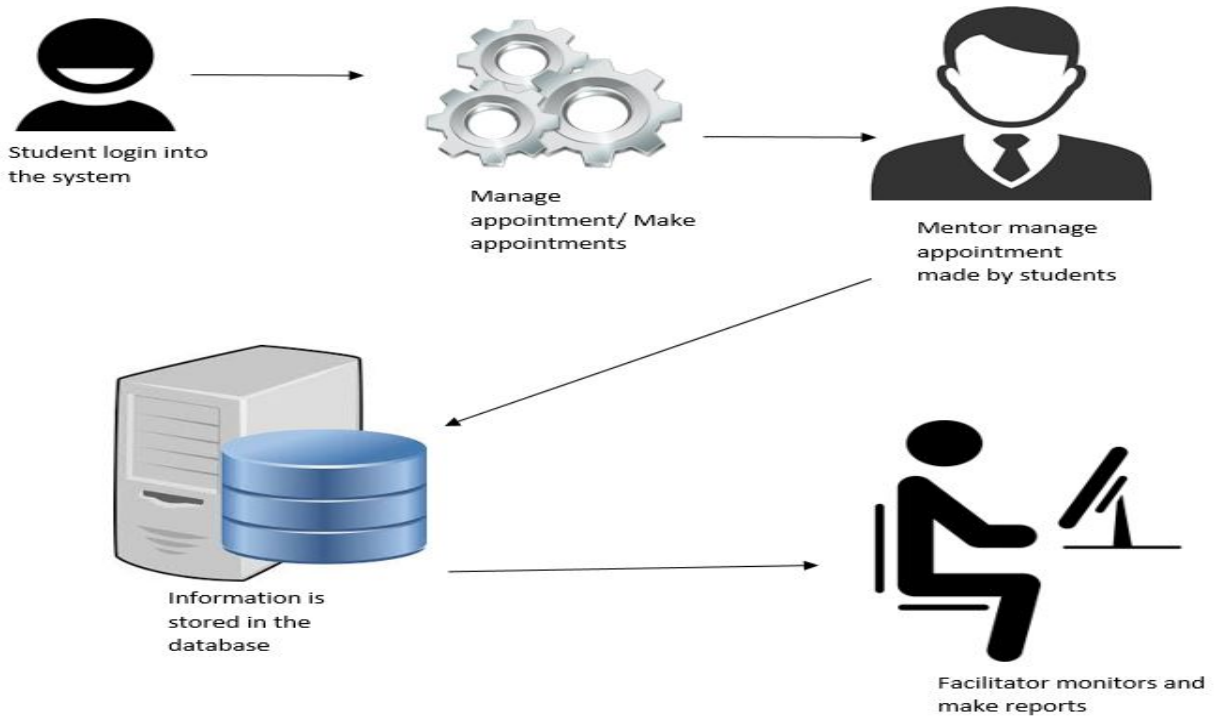

Fig. 2. System Architecture Diagram

The system requirements and design model of this system is converted into a fuctioning application. System implementation includes coding, testing and documenting the system as well as training the end users and system administrators.

System testing will be performed to find out errors, which result from unanticipated interactions of system components or units. The testing process is also concerned with validating the system to meet its functional and nonfunctional requirements.

For unit testing, coding and testing are carried out in parallel. The primary goal of unit testing is to confirm that the unit is correctly coded and that it carries out the functions it is supposed to carry out. The unit testing technique will be used to ensure that the bugs are fixed without side effects. Functions and procedures in each module are examined carefully for error after coding.

Next is integration testing. After performing the unit testing, the modules are integrated or combined into a working system. During the integration, the testing is carried out in order to identified the fault and failures caused by the integration.

The integration testing includes structure tests and functional tests. Structure tests emphasis is on exercising all input and output parameters of each module, and exercising all modules and all calls, including calls to utility routines. For example, the code block for menu bar on each module is integrated into only one procedure that can be called by all the modules. This will eliminate redundant codes and make the coding simpler.

For functional tests, the goal is to demonstrate that all functions specified for the system in the requirements and specification documents are operational.

Acceptance Testing: This is the final stage in the testing process before the system is accepted for operational use. This testing test is merely test the acceptance of the user towards the interfaces. After this testing stage, the interfaces design will be improved to fulfill the user needs.

System Development Results

This section presents the system development outputs. These encompass the functional and non-functional requrement of the system as summarized in the table below.

Table 1. The functional and non-functional requrements of the system

Type of requirement	Characteristic
High-level business requirements	The following are characteristics of High-level business requirements: 1. Create an appointment 2. Manage an appointment
Detailed business requirements	The following are characteristics of Detailed business requirements: Create an appointment 1.1. Ensure that when an appointment is generated that both parties are knowledgeable of the commitment 1.2. Ensure information regarding mentors' availability is updated as quickly as possible (ACID test) Managing appointments 1.3. Ensure that changes in mentors' schedules i.e. changes in their schedule is updated onto the system immediately (ACID test)
Non-functional requirements	The following are non-functional requirements: ● Easy-to-use and intuitive design ● Minimise bandwidth required to perform functionality ● Supports all browsers, and maintains a consistent aesthetic ● Ensure forms are visible, readable, and legible ● Minimise the number of web pages that need to be

	loaded ● Save current inputted values as a type of draft file that may be continued by the user after later access. ● Provide a form of feedback that notifies the user that the appointment has been sent successfully

We thereafter presents screenshots of the various outputs highlighting or showing how the system works. The landing page has the login form which requires username and password as shown in figure below. A user will be taken to their dashboards upon successfully logging in into the system.

Home page

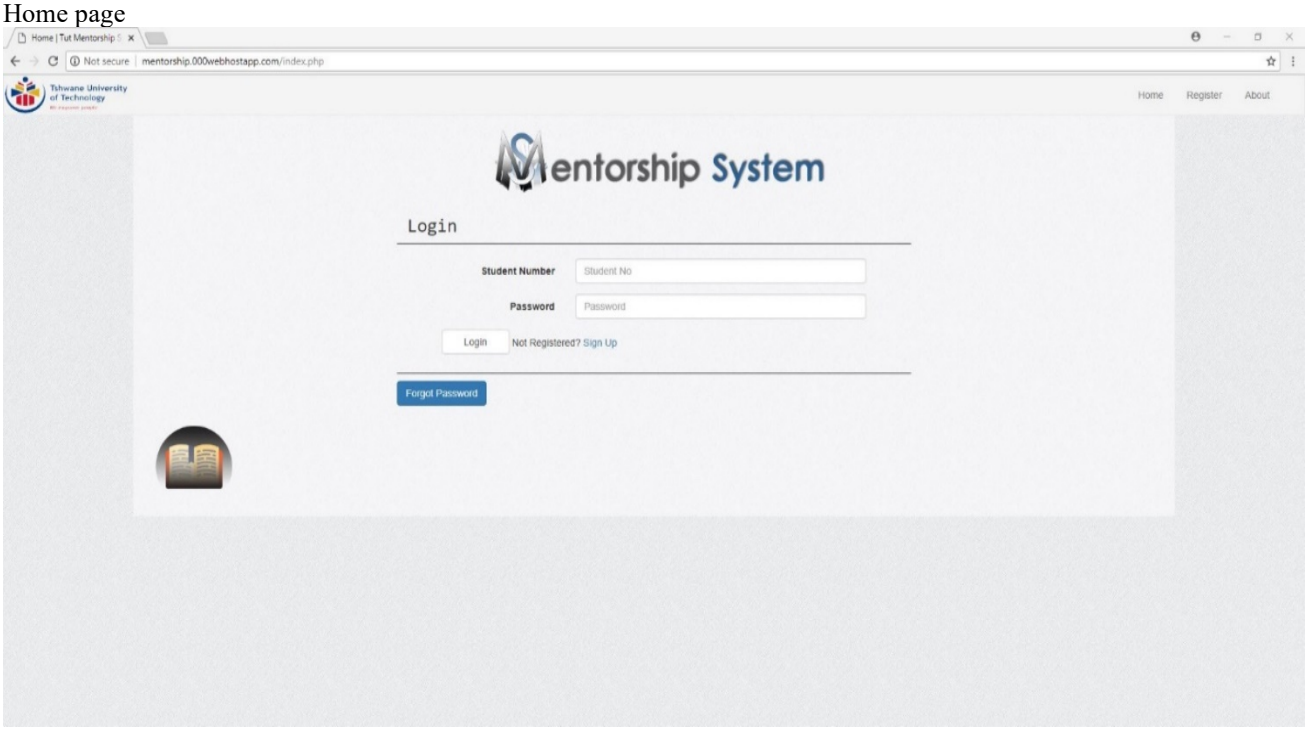

Fig. 3. Landing page for all the users

If the logging in into the system is unsuccessfully, it could be that the username is wrong or the password is wrong or have expired and needs to be changed. These days, many people have different password on various systems and so can easily forget which password is for which system. Therefore, there is the need for a page that handles changing of passwords. This page is given in figure below. Users will enter their student number or staff number and Identity or Passport number so they can reset their password. These are shown in the figures below. If the student number and Identity number are correct you will be directed to the page in the next figure then you can reset your password upon satisfying the password considerations such as the minimum lenght of the password being greater that 5 and the secret question successfully answered.

Next Page

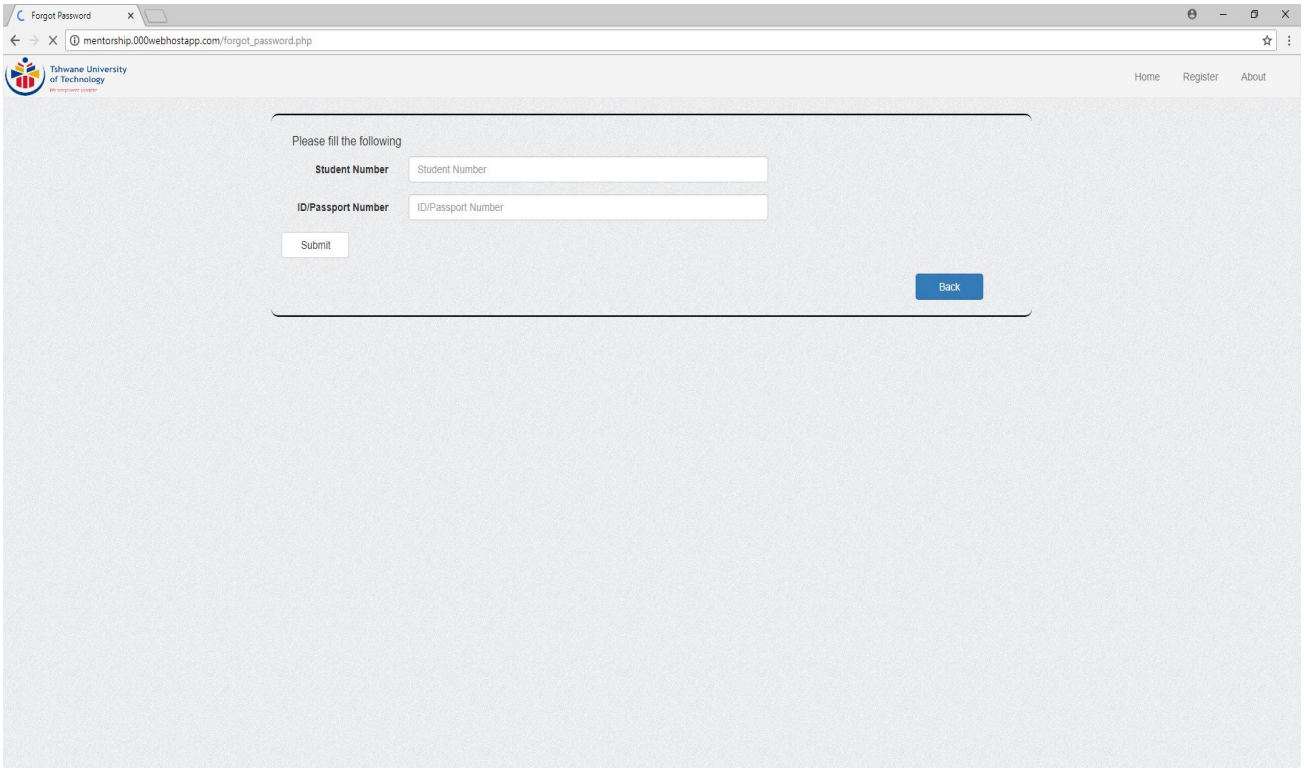

Fig. 4. Forgot password page.

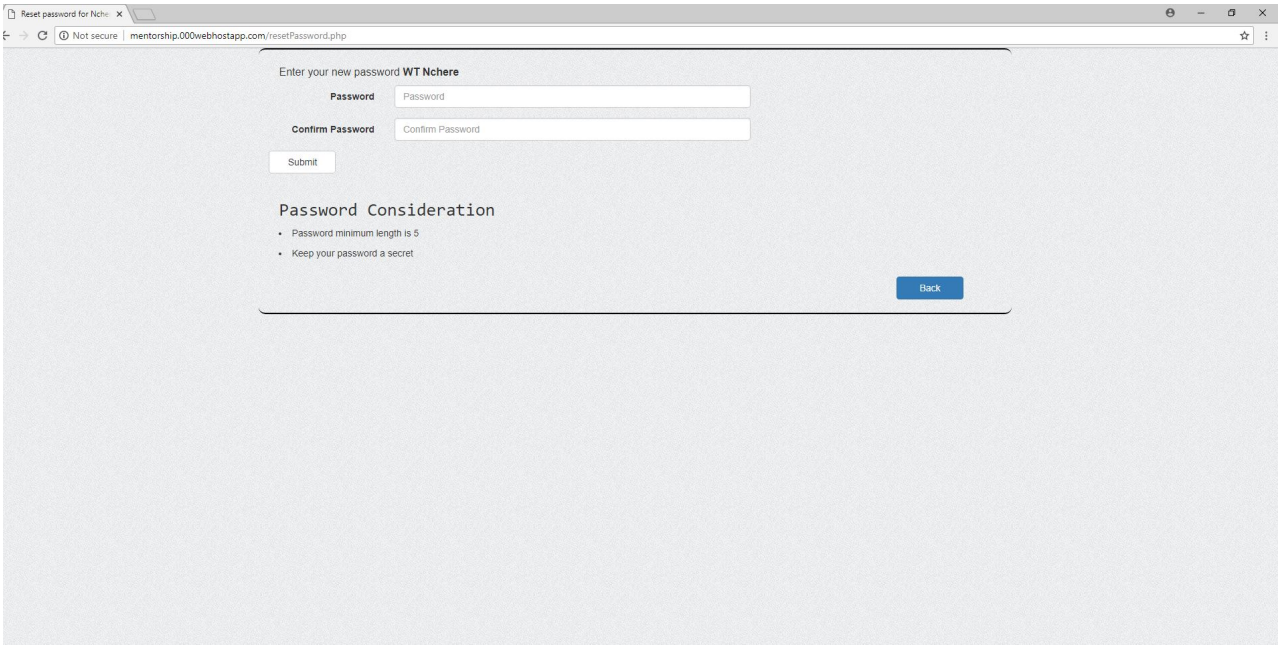

Fig. 5. Resetting password if the student number and Identity number are correct

After successful login or resetting the password and thereafter successful logging into the system, the system directs you a page depending on the status of the person logging in. The status could be as a facilitator, as a student or as a mentor.

Facilitator

Figure below is the landing page of the facilitator when they login into the system. The facilitator can add mentors by entering their student number and id number, which will be their username and temporary password. Then they can change their password later. If a facilitator clicks on the mentor he can see the details of the mentor image bellow.

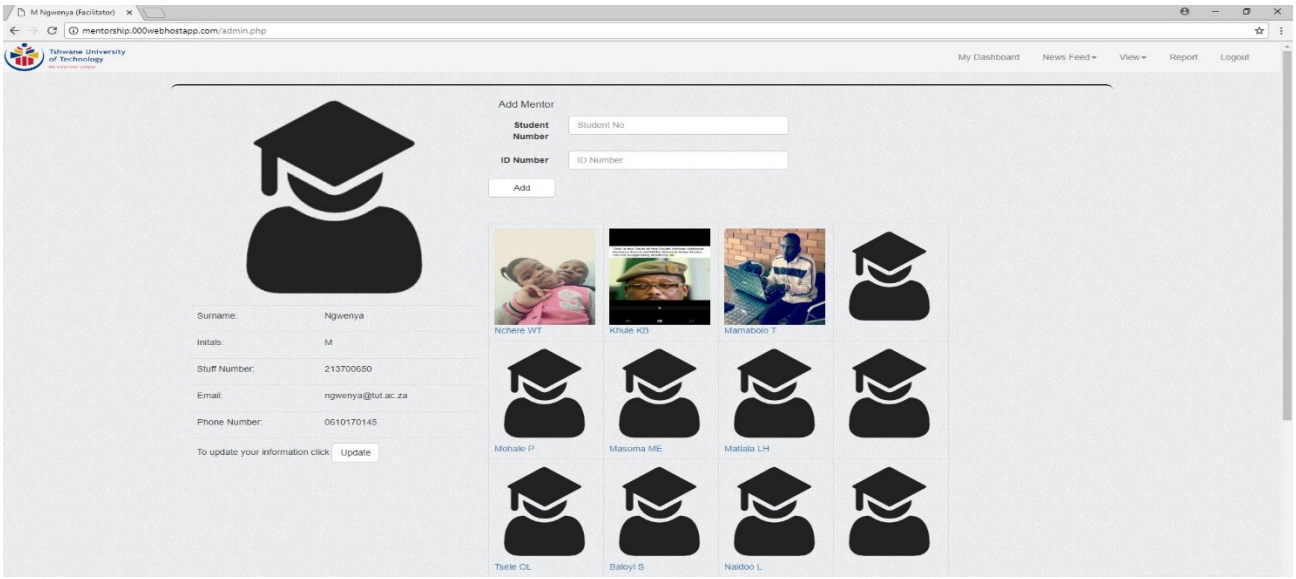

Fig. 6. Landing page of the facilitator when they login into the system.

Mentor

The following is landing page of the Mentor. The view of mentor profile shows their information such as surname and initials, student number, email, course code and the subject codes which they mentor. Also shown is the mentor's average rating out of 5 as given by their previous mentees. The mentors can also update their details and profile pictures.

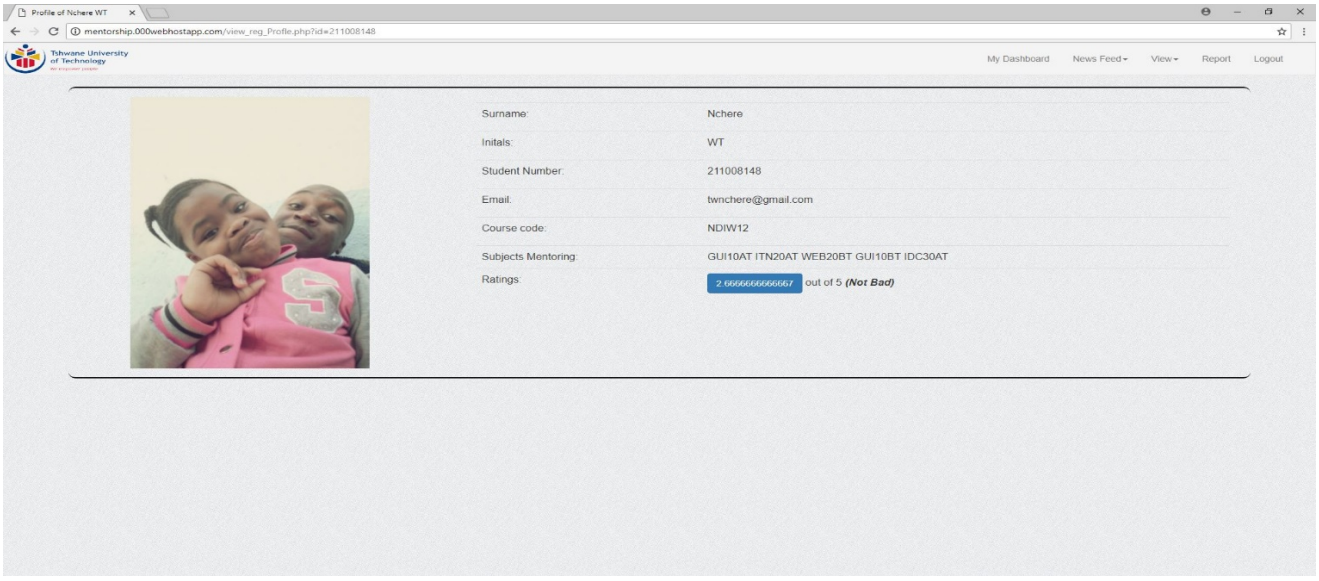

Fig. 7. The view of mentor profile after the mentor clicks on them

Figure below shows the Newfeeds page that provide communication between the Mentor and the facilitator. It is very vital that the system keeps record of communication as this can be used for evaluation purposes later to determine the impact of the mentorship programme.

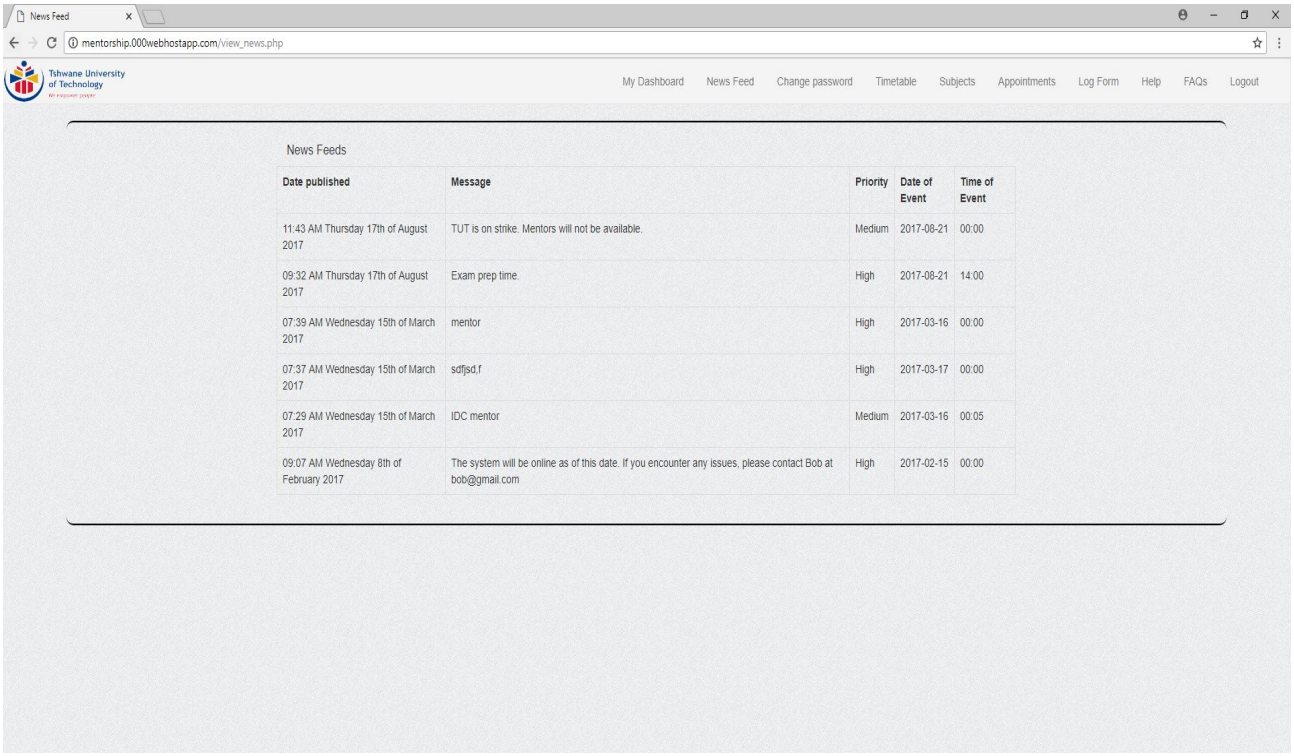

Fig. 8. Newfeeds page provide communication between the Mentor and the facilitator.

A critical part of the mentorship system is to enable students or mentees to book appointment with the mentors. To do so, the students or mentees need to see the timetable of the mentors showing their availability and unavailability. To this end, figure below shows the timetable page that provides the mentor with the timetable that they update to set their availability and unavailability.

Next page

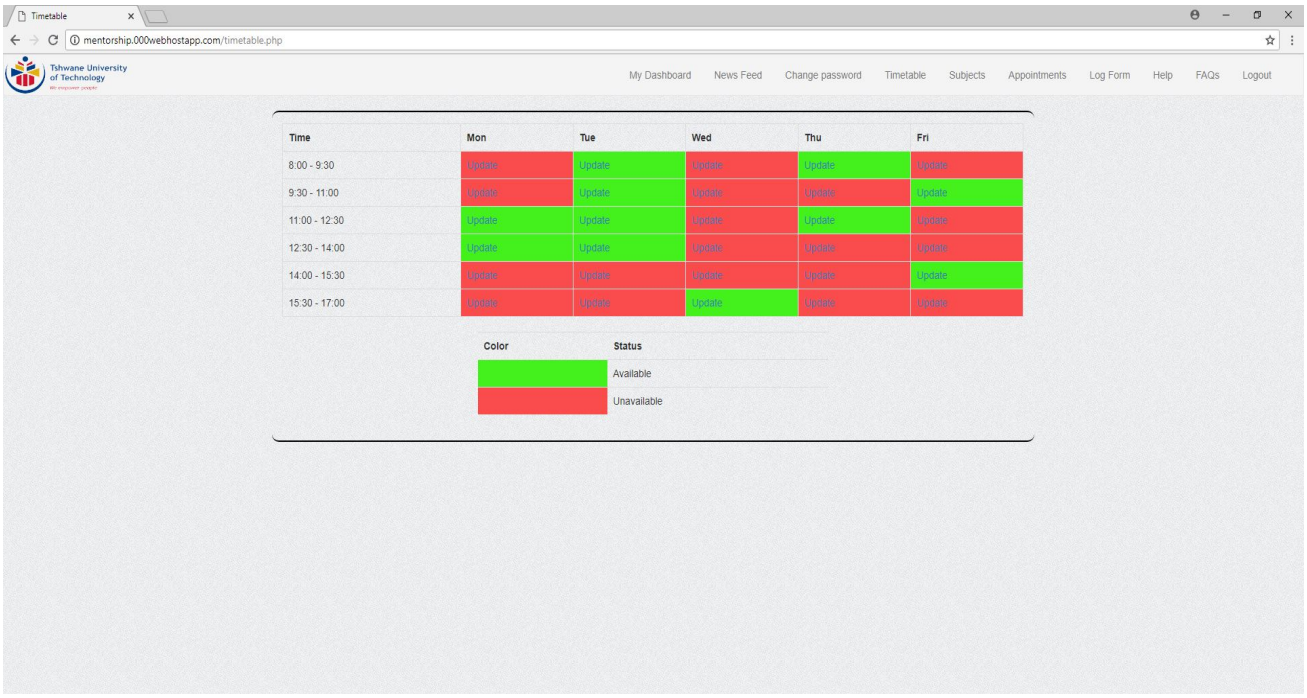

Fig. 9 Timetable page provides the mentor with the timetable that they update to set their availability and unavailability.

Sometimes, a mentor successfully gained new knowledge such as recently passing a new subject or personally use online courses and upgraded skills on a subject. Such situation may necessitate updating the subjects that the mentor can cater for so that interested mentees can see such and book for it if needed. Figure below shows the subjects page where mentors can specify and update the subject they are catering for.

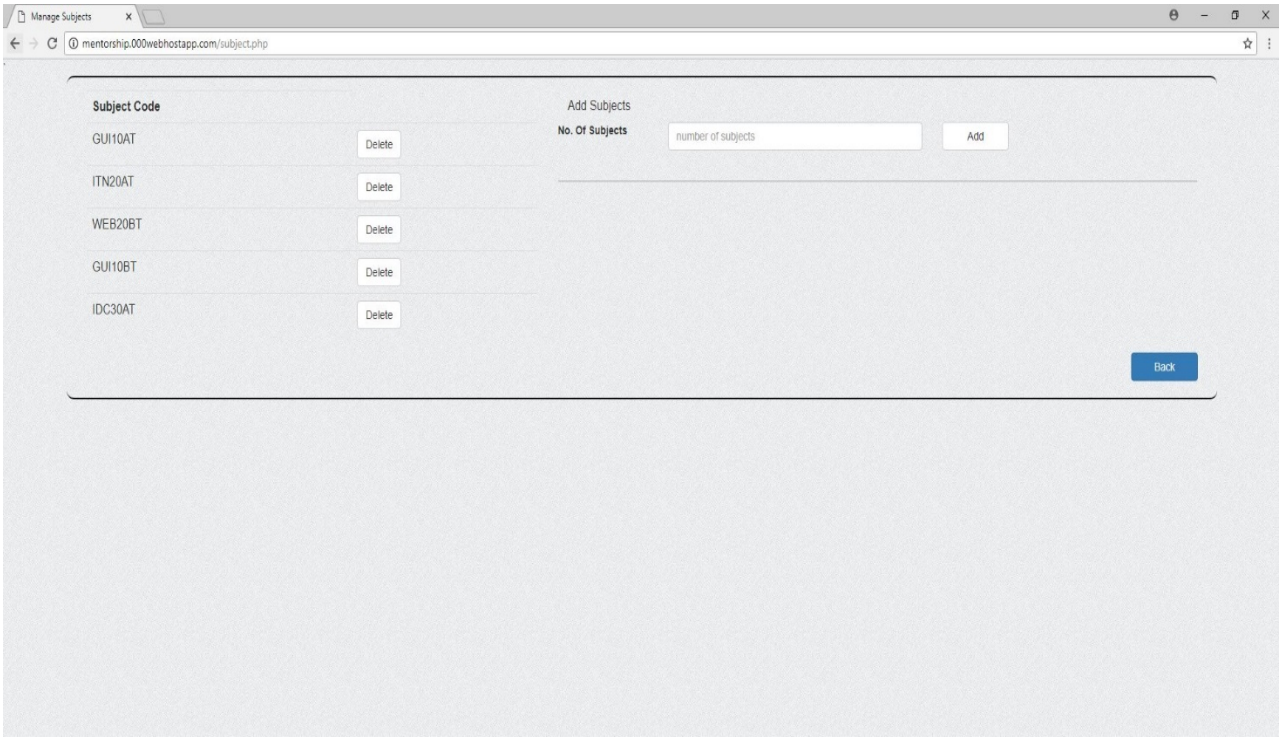

Fig. 10. Subjects page is where mentors can specify the subject they are catering for.

As the interested mentees see the subjects where mentors can specify and update the subject they are catering for. The mentees can see such and book for it. The appointment page is where mentors can manage their appointments. They can accept and reject an appointment. The status changes to successful when the session has happened

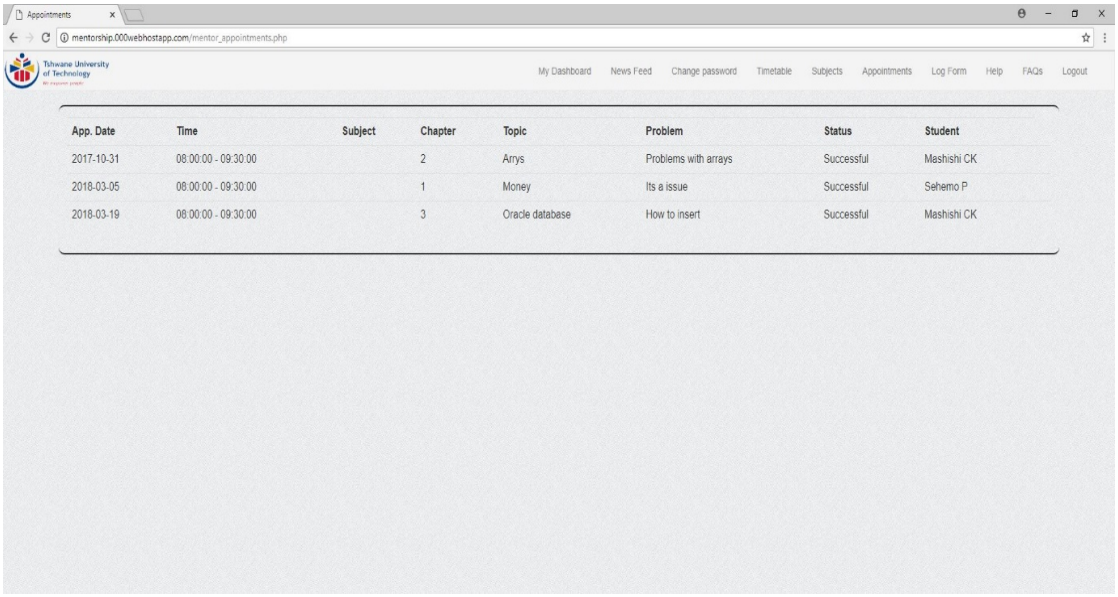

Fig. 11. Appointment page is where mentors can manage their appointments.

Students

For login with the status of students or mentee, access is directed to the landing page of mentees. The following figure is landing page of the student where they can update their personal details.

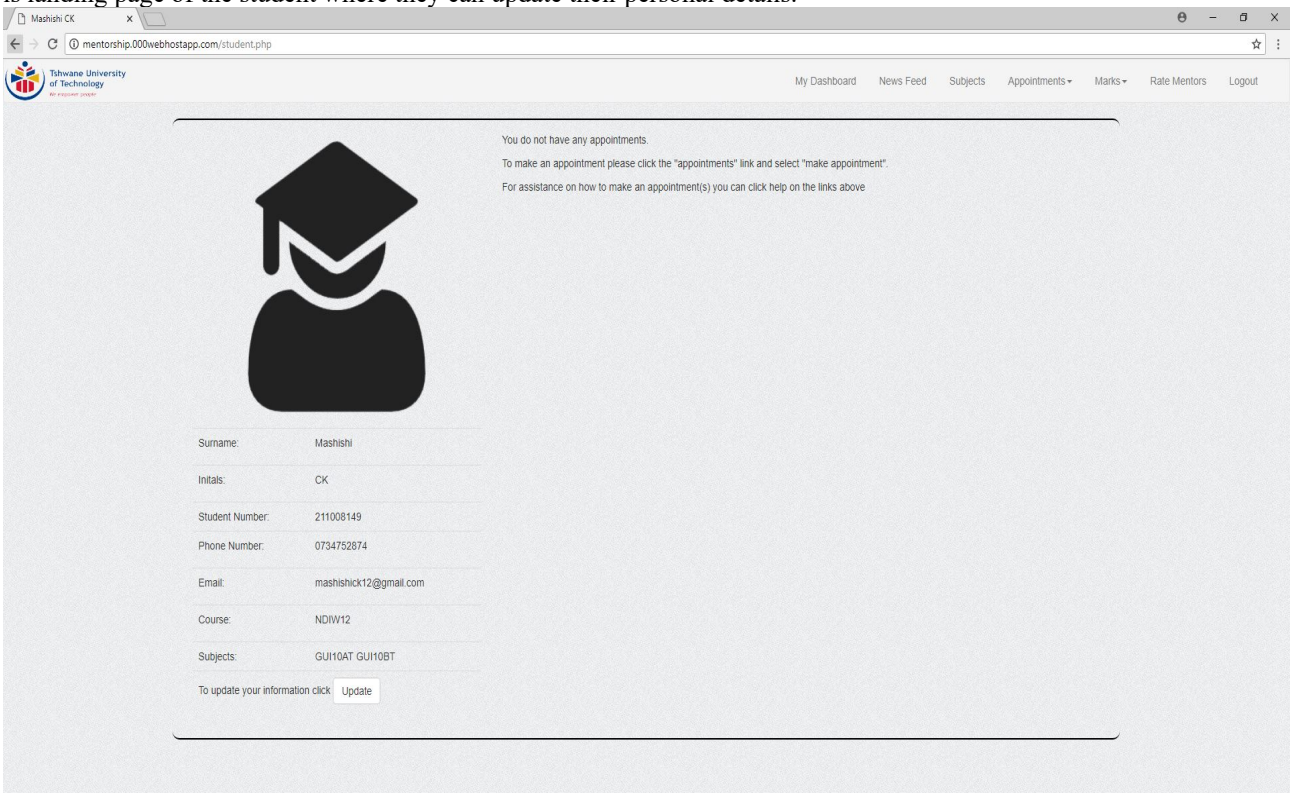

Fig. 12. Landing page of the student where they can update their personal details.

Figure below shows the Newfeeds page that provide communication between the Mentee and the facilitator. As in the case with the communication between the Mentor and the facilitator, it is also very vital that the system keeps record of communication between the Mentee and the facilitator as this can be used for evaluation purposes later to determine the impact of the mentorship programme.

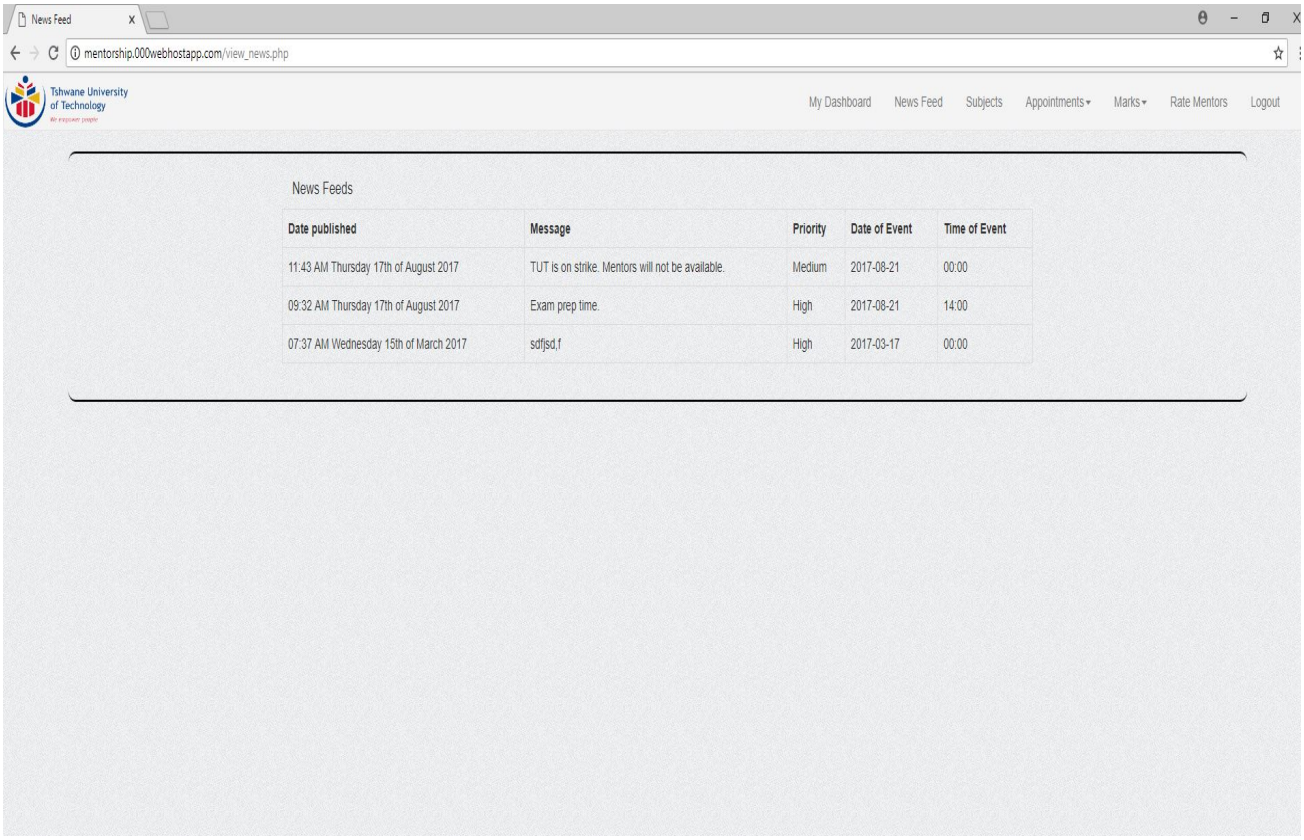

Fig.13. Newfeeds page provide communication between the Student and the facilitator.

The central focus of the mentorship system is for the mentees to be able to can search for mentors who are for a specific subject. The "Make appointment page" is where students can search for mentors who are for a specific subject. They can choose mentor of their choice then make appointment as illustrated in figure below.

Next page

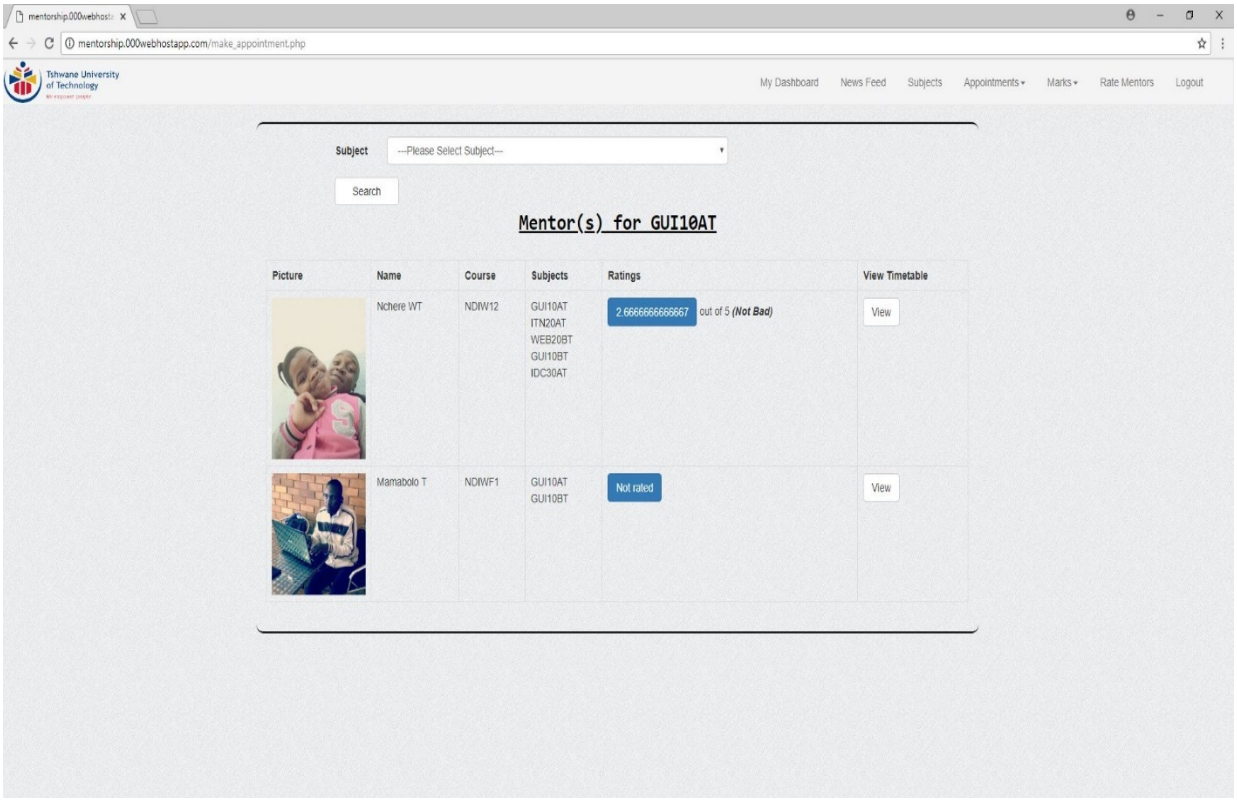

Fig. 14. Appointment page where students can search for mentors for specific subjects and then make appointment

The figure below shows the timetable page a specific mentor so that mentees their availability and book appointment accordingly.

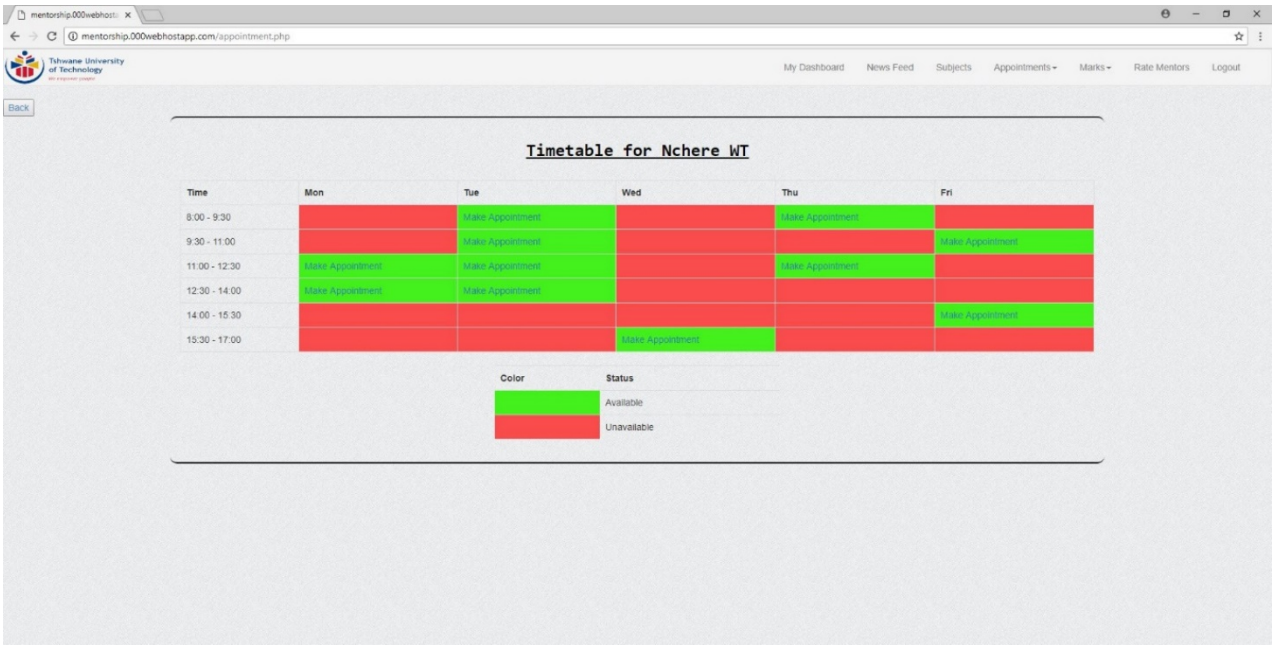

Fig. 15. Mentors' Timetable page is where students mentees their availability and book appointment accordingly.

When the mentees book for a specific appointment slot, a popup will appear such as in figure below, where the mentee can enter the chapter they need lessons on, the date for a lecture that is unclear to them, or a topic of a lecture that is unclear to them as well as the specific problem description that they need clarity on. These information will enable the mentor to adequately prepare for the meeting and where necessary also bring some clarifying examples.

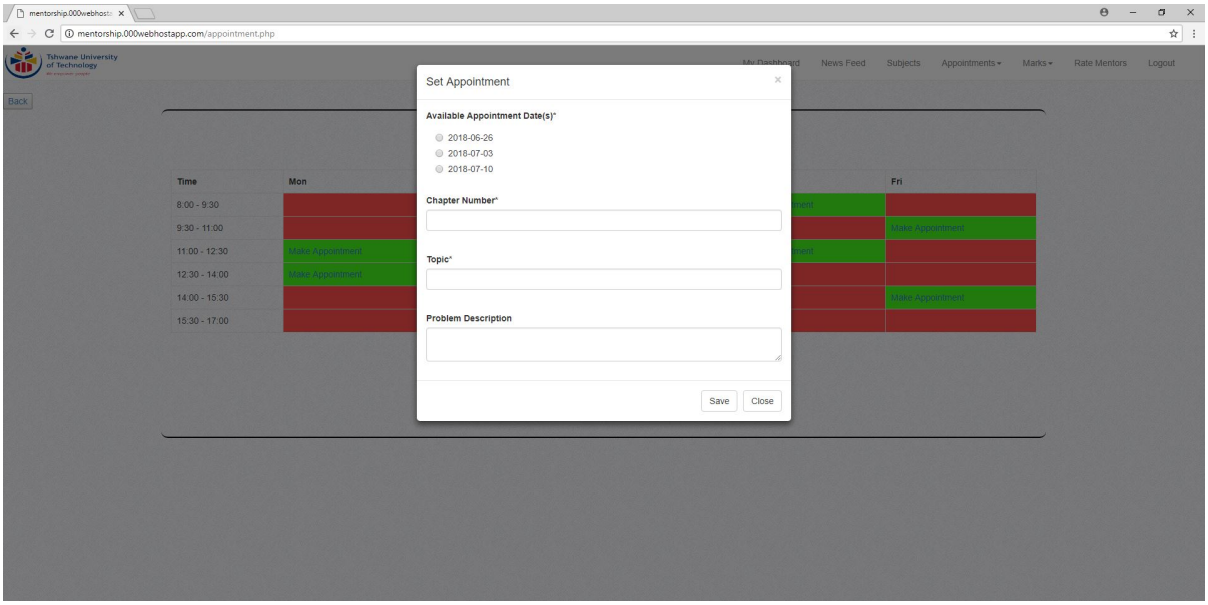

Fig. 16. A popup popup for the mentee to enter the chapter, topic they need lessons on

Conclusions

Imagine having to fill out a paper each time one seeks mentorship from one of the mentors at the university. Currently the university uses a file system which requires that mentors and students need to fill forms to make appointments and this cost university as papers are wasted and hard to manage if they are lot of them. Such process is boring and tiring, and most importantly not in line with the goals of sustainable development. Furthermore, the university will have to generate their mentorship reports manually by going through all the papers that was filled by students and submitted by mentor. This study shows that mentorship is a critical factor in the performance of students. Most of the student are depending on mentorship to pass their modules and fulfill the requirements to obtain their qualification in time. A suvey was initiated to see the performance of the students who seek mentorship and those who do not. Students who ask for mentorship have better performance than those who do not. The questionnaire was administered across different types of users which include Students, Mentors, and University staff to provide their experience with the system and provide valid feedback. Evaluation of the developed system appears to be of assistance to the students in their quest for mentorship and the students indicate that mentorship is effective in their academic success. It is also mobile friendly as students access it even through their smartphones. A help page is provided if a user get stuck and need to know how the application works. The university should invest in this project as it will help cut cost and help with make crical decision in terms of deciding whether to exclude a student. It would as such, provide a comprehensive structure of data storage. This system would be enabling the superuser (facilitator) to actively track users' active use of the system and monitor the impact mentorship has had on students' academic performances. I would also provide tools and functionalities required to demonstrate and report issues or pain points that exist within modules. In general, the Mentorship system will bring about conveniency and better decision making by the university. Student could engage with this system as it user friendly and it is accessible from anywhere, the students can make appointment at their own time. Since the school is providing free wifi access across the campus, assessing the application wont be an issue. And with the change to the use of the system leading to better student academin performance at minimal cost, productivity is enhanced and progress becomes sustainable.

References

[1] Achinstein, B. & Athanases, S.Z., 2005. Focussing new teachers on diversity and equity: Toward a knowledge base for mentors. Teaching and Teacher Education, 21, pp.843 – 862.

[2] Achinstein, B. & Davis, E., 2014. The subject of mentoring : Towards a knowledge and practice base for content-focused mentoring of new teachers. Mentoring & Tutoring: Partnership in Learning, 22(2), pp.104 – 126. Available at:http://dx.doi.org/10.1080/13611267.2014.902560

[3] Aladejana, A., Aledejana, F. & Ehindero, S., 2006. An analysis of mentoring relationships among teachers - a case study of OAU Nigeria. *International Journal of Evidence Based Coaching and Mentoring*, 4, pp.20 – 30.

[4] Andrews, B.D. & Quinn, R.J., 2005. The effects of mentoring on first-year teachers' perceptions of support received. The Clearing House, 78, pp.110 – 117.

[5] Bullough, R. V. & Draper, R.J., 2004. Mentoring and the emotions. Journal of Education for Teaching, 30(3), pp.271 – 288.

[6] Frels, R.K., Zientek, L.R. & Anthony, J., 2013. Differences of mentoring experiences across grade span among principals, mentors, and mentees. Mentoring & Tutoring: Partnership in Learning, 21(1), pp.28 – 58. Available at: http://dx.doi.org/10.1080/13611267.2013.784058.

[7] Graves, S., 2010. Mentoring pre-service teachers: A case study. Australian Journal of Early Childhood, 35, pp.14 – 20.

[8] Grove, R. 2009. "Web Based Application Development", Jones & Bartlett Learning, 2009.

[9] Hall, M. (n.d.). Emeritus professor at the University of Cape Town and former vice-chancellor of the University of Salford.

[10] Heirdsfield, A.M. et al., 2008. Peer mentoring for first-year education students - the mentors' experience. Mentoring & Tutoring : Partnership in Learning, 16(2), pp.109 – 124.

[11] Hirsch, E. et al., 2009. State policies to improve the mentoring of beginning special education teachers. Available at: http://ncipp.education.ufl.edu/files_6/NCIPP_Policy_ES_010310.pdf.

[12] Irby, B.J., 2012. Editor ' s Overview : Mentoring , Tutoring , and Coaching. Mentoring & Tutoring : Partnership in Learning, 20(3), pp.297 – 301. Available at: http://dx.doi.org/10.1080/13611267.2012.708186.

[13] Jones, R. & Brown, D., 2011. The mentoring relationship as a complex adaptive system - finding a model for our experience. Mentoring & Tutoring : Partnership in Learning, 19(4), pp.401 – 418.

[14] Kaiz, L.T., 2002. Framework for designing a mentoring program for novice teachers. Mentoring & Tutoring: Partnership in Learning, 10(1), pp.57 – 69.

[15] Lawy, R. & Tedder, M., 2011. Mentoring and individual learning plans - issues of practice in a period of transition. Research in post-compulsary education, 16(3), pp.385 – 396.

[16] Mathews, P., 2003. Academic mentoring: Enhancing the use of scarce resources. Educational Management Administration & Leadership, 31(3), pp.313–334. Available at: http://ema.sagepub.com/cgi/doi/10.1177/0263211X03031003007 [Accessed July 17, 2014].

[17] New York State United Teachers, 2010. The New York State mentor teacher internship program. NYSUT: Information Bulletin, (March), p.7.

[18] Moir, E. et al., 2009. New teacher mentoring, Cambridgr, MA: Harvard Education Press.

[19] Noe, R., Greenberger, D.B. & Wang, S., 2002. Mentoring - What we know and where to go. Research in Personnel and Human Resources Management, 21, pp.129 – 173.

[20] Orly, M., 2008. Mentoring mentors as a tool for personal and professional empowerment in teacher education. International Journal of Evidence Based Coaching and Mentoring, 6(1), pp.1 – 18.

[21] Ragins, B.R. & Cotton, J.L., 1999. Mentor functions and outcomes: A comparison of men and women informal and informal mentoring relationships. Journal of Applied Psychology, 84(4), pp.529 – 550.

[22] Schelfhout, W. et al., 2005. Training mentors to coach student teachers: An inductive approach towards activating teachers Paper presented at EARLI Biannual Conference, Nicosia, Cypress.

[23] The Alberta Teachers' Association, 2004. The program handbook: Mentoring beginning teachers. , pp.1 – 78.

[24] Wang, J. & Odell, S.J., 2002. Mentored learning to teach according to standards-based reform: A critical review. Review of Educational Research, 72(3), pp.481–546. Available at: http://rer.sagepub.com/cgi/doi/10.3102/00346543072003481 [Accessed July 17, 2014].

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