

EXPLOITING USE OF QR CODES FOR MONITORING MEDICAL STUDENT ABSENTEEISM

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ABSTRACT

Students pursuing the Doctor of Medicine degree have entered a profession in which full participation in the learning environment is an essential component of life-long learning and aligns with accreditation and licensing standards. As part of professional development as pediatrics-in-training, medical school students are expected to make their medical school schedule their highest priority. The medical school expects each student to contribute to small group learning by being an integral part of the clinical team-approach to sharing expertise and problem solving. These principles align with pediatric's professional responsibilities to their team and patients. Therefore, attendance and participation are expected in all educational activities, and are required for all small group and team-based learning sessions, seminars, as well as other unique sessions as specified by the Course Directors. Attendance and participation are assessed and documented in the Medical Student Performance Evaluation. Lack of attendance data and coordination can make recording and analysing attendance data problematic, as the value of attendance data is dependent upon accuracy, speed, consistency and accessibility to data. This research investigates the potential of application of Quick Response Codes (QR Codes) to replace the manual methods of monitoring student's attendance which can be time consuming.

KEY WORDS

QR Code, Attendance, Prince Marina Hospital, Absenteeism, success. UB School of Medicine.

1. Introduction

There is growing concern about absenteeism at tertiary institutions as it is perceived to be linked to student's performance. Globally learning at University is considered to be carried out by students who are self directed and hence do not require their class attendance to be monitored. However with increase in class enrolments in high education, absenteeism for educational activities at university level is becoming an issue now. [1] Have shown that there is high prevalence of absenteeism in South African universities. Previous studies have shown that there is an increase in the trend of students being

absent for lectures and tutorials [2], [3], [4]. For medical training purposes class attendance is important and it is assessed. The UK General Medical Council (GMC) defines absenteeism as being absent for more than 20 days for a 12 month period of study for a foundation programme. A doctor who exceeds this will require an additional extra period of training [5].

UB School of Medicine still use the old system of taking attendance of students through giving attendance register sheets to students to sign and then analyze it later to determine those students who were present or absent. Through this method, it is easier for students to cheat by asking others to sign for them even when they are not present. Students can sign and leave before the end of the seminar, or come late and sign without participating on the events for that seminar. The possibility of losing the attendance sheet is high. The overall process is just tiresome for lecturers that at some times they fail to take it from students or students disappear with the attendance sheet. The process also disturbs the learning process as the sheet needs to be passed around for each individual student to sign.

2. Literature Review

Absenteeism is defined as not being available during the delivery of course material without a valid reason [6]. It is a personal decision by a student related to ability and motivation to attend academic activities [7]. [8] Also define absenteeism as school refusal behaviour. Student absenteeism at university level has been shown to lead to poor academic performance and inadequate learning [9], [10]. Student absenteeism affects the lecture, other students present and the whole learning environment especially in interactive learning [11].

Failure to attend seminars and classes has proven to have a negative effect on the performance of medical school students as illustrated by many reports and literature [12]. Generally attendance is an important issue that needs to be managed at all levels of academic institutions. [13] Proposed development of attendance policy to deal with absenteeism at Botswana tertiary institutions.

[14] State that there should be a system for promoting attendance, recording attendance and absence and for addressing lateness and absence of all students and to

ensure consistent implementation of such a system. It further illustrates that, for an attendance system to work, the system implemented should include timing of the school day and for register closer. Schools should have a written policy on the times the register is open and closed, for example closure of registers thirty minutes after the start of the an examination is recommended by the University of Botswana. Registers should not be kept open for any longer than this except for example on a day when the weather is very poor, and a school may for that one day only, extend the time for an additional five to ten minutes [14]. Many systems have been designed and implemented to record and track attendance in schools and some are described below together with thier advantages and pitfalls.

2.1 Traditional paper based system

This is the most used form of recording attendance which is used by most schools in developing countries. At the start of each lesson, a paper is passed around for students to write thier names and student IDs or tick against thier names. The main advantage of this method is that it is cheap as it only requires pen and paper. However it is time consuming; disturb conduct of lesson/seminar when paper is moved around. Students can also cheat by ticking for friends who might be absent especially in large classes. The attendance register can also be misplaced. This method is currently used by UB School of Medicine. The method has limitations; hence the school is exploring the possibility to replace it.

2.2 Student identity cards

This method is also paper-based and has the same advantages and disadvantages as the traditional method. Here the lecturer is the one who goes around the classroom ticking the present students after confirming from thier student Identification card which has student details and thier face photo. The only disadvantage it tried to solve from the traditional one is that, it is not easy for students to cheat since the lecturer is the one recording and they must have thier ID cards with them.

2.3 Access control cards

Under this method, the students have to swipe thier access cards through an established access point. It is also used for security reasons like giving access to certain classrooms. Once a student swipes thier card, the information is sent to the server. The server then checks availability of the student details and adds a timestamp as to when it was swiped therefore recording the attendance. This method advantage is that it is quick and user friendly once it is set up. The data is aslo captured electronically making it easy to manage later. Its main disadvantage is that it can be expensive to install and maintain. Students may also cheat by swiping access control cards of thier friends who are absent.

2.4 Biometric based system

This is the most accurate attendance system since it uses biometric devices. The students are supposed to pass through a device with a biometric lens to capture thier finger print, iris, face, and update the attendance register. This method is accurate, does not disturb conduct of lesson as it is done at entrance and it also captures data electronically. The main disadvantage of this system is the high installation and maintanance costs it requires.

2.5 Quick response codes system biographies

This is the new system which was introduced late 2012. A QR Code is generated and printed on student ID cards and are scanned by a Smartphone with an installed QR Code reader. Once scanned, the information is decoded and stored in the database for processing and report retrieval. This method is cheap, does not require installation in a specific building and also capture data digitally. The system can negatively affect lesson when the system is not working or a student has lost an identity card. However these occurances are rare. This is the method that this research is developing to solve class attendance of paediatric lectures at Princess Marina Hospital by University of Botswana students.

2.5.1 Quick response codes basics

Quick response codes normally referred to as QR Codes are two dimensional codes that consist mostly of black square dots on a white background. They were developed to track parts in car assembly plants in Japan. A QR code is capable of storing up to 4200 characters (numbers, text or symbols). Majority of modern smart phones can easily and quickly decode the information from QR codes. Software to read QR code is now pre-installed in mobile phones or can easily be down loaded for free. They are fairly robust as they can still be used even if up to 30% of thier surface is damaged or altered without affecting thier functionality [15].

2.6 Proposed solution versus existing solutions

The proposed solution is based on the last method of using the Quick Response Codes for tracking attendance simply because the reason why most of the African countries are still using the traditional method is due to the fact that they are still developing and they find all other methods expensive as they developed through the years. The use of QR Codes has not been explored much since it is a new technology and needs to be exploited even further. So far the systems that have been developed for this method are just static, they just store information for the purpose of coming up with relevant reports.

The problem that is being faced by the University of Botswana is students attending wrong classes and examinations and realizing after sometime, which disturbs

class or students writing in wrong classes which results in their exam scripts being lost. In order to solve this problem quickly, the system should be able to give feedback to students within a few seconds after they have scanned their cards, informing them of the classes they are attending or if they are not in the class list for that class. This should be done by sending an SMS to the student's mobile phone number registered in the system. This is feasible because every student owns a mobile phone in the University of Botswana. Provided the mobile phone is on silent mode it will not disrupt the learning process.

2.6.1 Required hardware

The proposed system hardware requirements are a QR code generator, mounted Ipad/tablet or smart phone. The QR code generator is freely available on the web. The Ipad/smartphones have to be issued to the lesson tutor by the institution. Figure 1 and Figure 2 illustrate the required hardware.



Figure 1. QR Code V-card/student card.

The generated QR Code is attached to the back of the student's identity card to be read by a lecturer's Ipad or smart phone as shown in Figure 2.



Figure 2. Handheld phone or mounted tablet for scanning student's cards.

2.6.2 Operations of the proposed solution

A database is created to store student's details. The database can be server based, but a cloud based space is preferred to minimise operations costs. QR codes are generated using a QR code generator that is freely available on the web. The generated QR code is attached to a student ID.

At the beginning of a seminar, lecture, tutorial, exam etc a student swipes their ID on a mounted Ipad or smart phone mounted somewhere at the entrance. Their details are automatically sent to a database for verification. If valid they are allowed in or if invalid a warning is made to alert the instructor. The process is repeated at the end of the learning activity. The system will record the time stamp to be able to determine the duration of the student attendance. The time difference can later be used to determine if it constitutes the required attendance duration.

An SMS or email can also be sent to the student to confirm their attendance registration. A lecturer can generate attendance reports from the database at any time. Figure 3 illustrates the proposed system.

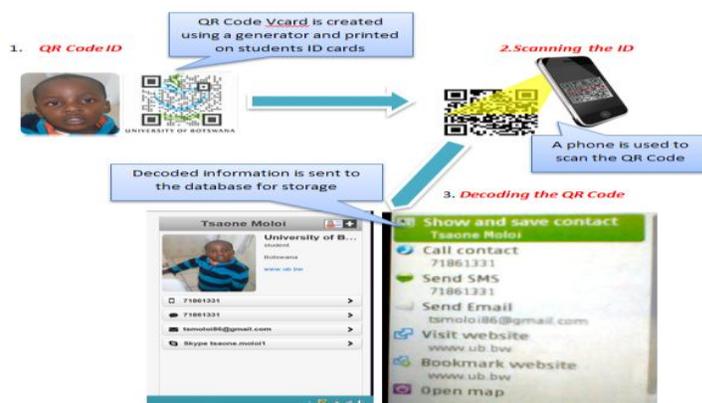


Figure 3. Graphical illustration of the proposed systems.

3. Justification of the proposed solution

The application of QR codes provides a method which is convenient to direct users to web page, phone number, and promotional material. It is increasingly being used for marketing purposes. Their use is environmental friendly as it minimises the use of printed material. Since the codes are produced freely it makes their application to be cost effective. They do not depend on a particular platform hence can be used on different smart phones or Ipads. Action that is initiated by the codes can be followed using web analytical tools.

4. Managing student absenteeism

A recent research on absenteeism specific to tertiary education in Botswana recommended the introduction of class registration and monitoring attendance [13]. Therefore the School of Medicine is a step ahead in the fulfilment of this. The biggest challenge is that class enrollments have increased. It is not surprising to have a class of over 100 students. In such large classes taking class registration using pen and paper will significantly

consume a good part of the scheduled class time. Currently the lecture period in University of Botswana is about 50 minutes. If it takes a student a minute to receive, sign in and pass the attendance register, then in a class of 50 students there will be continuous disturbance of paper circulating within the lecture room throughout the lecture period. The situation will be worse for even large classes. While it is important to monitor student attendance, this must not interfere much with the conduct of the class or seminar. This project is exploring the possibility of using QR codes to monitor class attendance in such a way that it minimises class disturbance.

5. Conclusion

Absenteeism is a major problem that needs to be addressed in institutions of higher learning. In medical schools student's absenteeism is addressed by rewarding attendance with academic points. However the traditional manual process of pen and paper is not effective in managing student attendance. An effective and cheap method of monitoring student's attendance is recommended. Use of QR codes to monitor student's attendance has the potential to provide an effective and cheap solution. QR codes do not require expensive infrastructure. It is important to use a method that does not require additional costs to install and maintain. Such an approach will lead to the cost being passed onto the students. Already university education costs especially medical training costs are high and any increase will worsen the situation.

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