

Increasing NCD Awareness in School through Physical Education (PE) Subject: An Informatics Approach

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Abstract

Non-communicable disease is a medical condition or disease that is by definition non-infectious and non-transmissible among people. Currently, NCDs are the leading causes of death and disease burden worldwide. NCD usually attack elderly or more can we say that is only realized when people come to a certain age. To prevent this from happening, a solution has been proposed to start the awareness as early as possible. The proposed solution is to implement the awareness program thru Physical Education (PE) subject in both primary and secondary school. This proposed framework will have four main modules, Students Health Management System, Health and Fitness Apps, Health Education through Blended Learning and Fitness Training. This framework will involve minimum of three users, the PE teacher, students and parents. The data contains in this framework will be stored using cloud storage technology to ease the access from all side. The main objective of this proposed solution is to enforce the healthy lifestyle in the students and hopefully can reduce the chances of NCD.

Keywords: *Non-communicable disease, health education, physical education, prevention, cloud storage*

1. Introduction

Non-Communicable Diseases (NCDs) refers to a host of medical conditions that is non-transmittable which sum up cardiovascular disease, diabetes mellitus, cancer and chronic respiratory diseases. These serious syndromes had been acknowledged as the “Big Four” mainly described based on patients prolonged illness enduring

conditions with minimum three months and development of wellbeing [1]. Cardiovascular diseases incurred by a patient can be comprises of heart disease, hypertension, heart failure or stroke continue to be prominent causes of deaths worldwide [2].

One of the top occurring NCD cases that had caused highest mortality rate globally is the heart disease. Heart failure is diagnosed when one suspect patient fulfilled one of these criteria of having orthopnea or paroxysmal nocturnal dyspnea (PND) and at least two of three additional heart failure symptoms (edema, reported breathlessness on exertion, heart rate >120 beats per minute) or orthopnea and PND with at least one of the three additional mentioned symptoms [3]. Preventing cardiovascular disease by discovering the primary risk factors in relation to tackling this heart disease are the focus of conquering the barriers towards effective elimination of the NCDs [4].

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The root cause on the emergence of NCDs may originate from numerous factors. The chronic disease risk factors include individual habit of smoking tobacco, improper diet; sedentary lifestyle linked with overweight, alcoholic and mismanaged hypertension within population in the country. The risks is amplified within an individual by the incidence and pervasiveness of having critical illness combined with population demographics such as ageing and health status [5].

Malaysia's Transformasi Nasional 2050 (TN50), a long-term development blueprint announced by Prime Minister Najib Razak in his 2017 Budget speech, is ushering in a bold new mode of policy making [6]. In TN50 there are 9 key drivers and one of it is People and Value. This key driver is the most accurate to handle the issue of NCD. This is because we are trying to increase the awareness of NCD towards citizen to enhance the life of the citizen. There are six megatrends in the TN50 and this paper is aiming to go for the Virtualization megatrends. This is because we are aiming to propose an informatics approach kind of solution. Virtualization is a megatrends government wants to fully utilize digital technology to enhance the service. The technology that we are going to focus in the solution is the cloud computing. Cloud computing is a very common technology that widely used nowadays because of the effective accessibility of data anywhere as long as we are connected to the internet. We will discuss further how the solution proposed will make use of cloud computing.

The proposed solution in this paper is targeting the school students in increasing the healthy awareness. By monitoring, controlling and encouraging the student' healthiness, the rate of NCD can be reduced. The use of cloud computing in this solution is to store the personal health data of the students that the can be viewed by the teacher and parents. The data might able to be used by the medical practitioners whenever needed. The expected impact from this solution is to increase the NCD awareness among the school students and hoping to prevent NCD at early stages. The ease of accessing health data to help medical practitioners in diagnosed the students if need is also one of the impact. Figure 1 show the impact of the proposed solution towards key drivers.

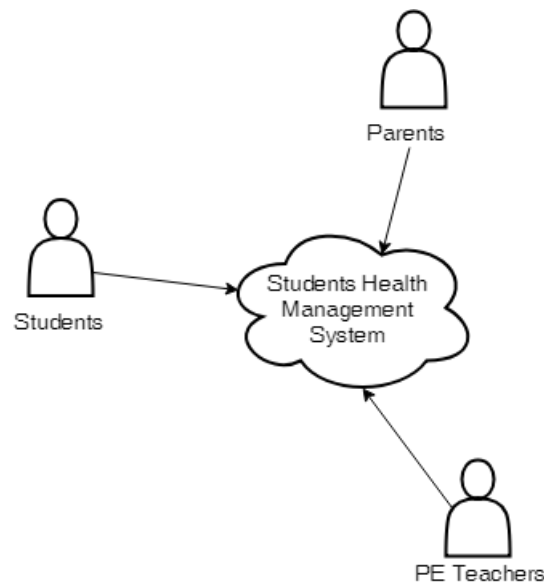


Figure 1 Key driver & Proposed Solution

2. Working Background

Non-communicable diseases (NCDs) shows a large and expanding volume of the overall concern of disease, NCDs are made up of NCDs are largely preventable, and many are driven by four big risk factors, physical inactivity, unhealthy diets, tobacco use and a harmful use of alcohol. Not only are these risk aspect linked, but they are all rooted in the social motivation of health, which are driven by the cultural, economic, and political factors. NCDs are a global problem; however, they overly target the poor, affecting those who are already exposed. NCDs represent one of the world's major health challenges, both in terms of human suffering, as well as negative impact on socioeconomic development in all countries. Cardiovascular diseases are by far the leading killer, with more than 5 million deaths estimated to take place annually from these causes alone. By 2030, NCDs are estimated to contribute to 75% of global deaths, which means that NCDs are having even greater impact on all levels of health services, as well as health care costs as they are having today [8].

Even though there is a wide knowledge to diagnose and treat NCDs, but few are aware of the public health mediation that can reduce these diseases. This is due to a lack of representation of disease prevention, public health interventions, and ways to strengthening of public health system, in the medical school curriculum. It is estimated that 73% of the total deaths in Malaysia were due to noncommunicable diseases (NCDs), and half of the number were caused by cardiovascular diseases. The burden of disease attributable to overweight or obesity is likely underestimated with the NHMS 2011 indicating a high proportion of undiagnosed diabetics and hypertensives; the survey estimated that for everyone person diagnosed with diabetes, another remains undiagnosed, and for every two known hypertensive adults, three remain undiagnosed. Deputy Health Minister Datuk Seri Dr Hilmi Yahaya, said based on data from the National Health and Morbidity Survey

(NHMS), it could be assumed that the prevalence of NCD risk factors continued to rise and was indeed a worrying trend for the country [9].

Since 2014, around 40,000 volunteers were trained in their own “kampong” to check on patients with high cholesterol and glucose level, as well as high blood pressure. The global health community, understand that chronic diseases are a present danger to the health of our societies. Yet we are unable to translate that understanding into real political action. We cannot bring ourselves to put heart disease, stroke, cancer, chronic respiratory disease, diabetes, or mental illhealth, together with their associated risk factors, on an equal footing with childhood pneumonia and diarrhea, preventable maternal death, or epidemics of AIDS, tuberculosis, and malaria. The disconnect between the reality of people’s lives in countries and the concerns of professional and political leaders has rarely been greater.

The main vision of this study is to improve the health level of Malaysian citizens by preventing NCD at the early stage. Prevention can be achieved by applying various technique and models as we had mentioned above such as health campaign, awareness, medical infrastructures, ICT facilities and many others. Yet, extra insights should be taken to discover any new potential from different perspective such as the improvement of current model in the ICT views. In line with the modernization of mega-cities and suburban area, ICT has provided various infrastructure that help in connecting people and information throughout the world. Hence, there are many features that ICT could provide to the community to steer away from NCD effectively. In the next section, we will discuss more on the ICT perspective that emphasize on the communication effectiveness, speed, data consistency, storage capability and more to support the prevention of NCD in the future.

In this study, the working framework will be narrowed down to PE subject in schools. The informatics roles for this study will also be narrowed down to the use of cloud storage to store health data of the students and can be accessed by the teacher and parents.

3. Literature Analysis

NCD can be prevented by effective management and control of the risk factors at the early stage. In Malaysia, there are many screening programs that are made available for the citizen to access the healthcare service. This service can be accessed either through the private sector by paying some fee or even through the public medical institution without any fee. Most of this public program was provided by the government of Malaysia through the initiative of the Ministry of Health with a primary focus to reduce the significance increment of NCD in Malaysia for the last two decades. From 2010 to 2014, the NCD Prevention 1 Malaysia (NCDP-1M) program has been launched nationwide to detect any symptoms or risks that may cause the development of NCD through various health awareness and screening

programs. NCDP-1M is a benchmarking program leads by the Ministry Of Health to quantify the level of awareness by spreading the importance of NCD prevention at every corner of the country to minimize the NCD rate among Malaysia citizens. NCDP-1M has been implemented to respond to the requirements from various states, districts and also the wide communities within those districts [6].

Despite the broad coverage of the program execution, NCDP-1M faced a lot of challenges especially in accessing the value added to the health sector in the top level view. The information gained from the screening program may not be completely distributed back to the higher ground from where it started. NCDP-1M program kicked off from the tiniest community scope via various NCDP-1M competence agencies such as Klinik Desa 1 Malaysia (KD1M), Village Health Promoter, Primary Health Care Volunteer and Health Clinic Advisory Panels [6]. By going deep into the process level, there might be some differences on how they understand and handled the screening activities even though there are training and guidelines provided by the NCDP-1M scheme. This may resulted in inconsistencies of data collection among them. Hence, final information provided to the top level management will not be that accurate and there shall be possibilities for invalid data.

During the program implementation, NCDP-1M has been monitored through submission of online templates from each district. This online process allows constant monitoring of various sub-projects such as community-based weight loss programs and numerous paper-based records. For some remote areas, there might be some difficulty in submitting the information to the higher ground or center data storage because of the inadequacy of hardware availability like personal computer (PC), local area network (LAN) and internet hub. Fortunately, there has been ongoing effort by the government sectors to invest in Information and Communication Technology (ICT) development to further progress the establishment of networking and hardware facilities in these rural regions [6]. Yet, the development is too slow and still left far behind the milestone set by the Malaysia government since their launching in 2000. In example, the development of telecenters in Malaysia such as the Rural Internet Centre (Pusat Internet Desa, PID), Mini RTC, Rural Broadband Library and many more have suffered from ineffective project management that caused the efforts to burn into waste. Hence, the lack of ICT infrastructures shall affect the effectiveness of NCD prevention through the NCDP-1M program. [7]

Besides that, NCDP-1M is catalyzed by the holistic efforts by various individuals including the medical professionals and also the public volunteers. The participation of the community through various Health programs that have been offered is essential in achieving the main goal of the main program which is to prevent NCD plague from spreading in Malaysia. Unfortunately, it is hard to access the quality of each implementation since it is not consistent across districts [6]. Some of the centers have insufficient human resources thus becomes a burden for some of them to engage with the given task. Plus, some district has been allocated with very limited medical resources and supplies that are necessary to conduct the health programs. So, these problems have caused inequality of workload during the implementation

of NCDP-1M and might resulted in inconsistency of work efforts by the team that may impairs the quality of the project in certain districts.

Other than that, there have been many opportunities raised by the government of Malaysia in inducing the community to seek for health services. There are numerous numbers of health awareness programs have been executed in the past few years and most of it is to expose the community with the danger of NCDs by describing the early symptoms and its prevention. Despite the efforts, the knowledge and free health facilities offered are still not wholly distributed and accepted by the community. This issue might be caused by various reasons that mostly associated with the sociocultural beliefs in Malaysia. Malays are afraid to seek for doctor. Most of them were too late in meeting the doctor to get medical assistance for their health issues in which that some of them have developed NCD and sadly, it is too chronic that there is nothing can be done to cure it. Plus, the Malays are very afraid of their health problem in which there are some thoughts that prefer to die peacefully without wanting to know the disease that they are having. Thus, this poor mindset should be changed in order to improve the significance of NCD prevention in Malaysia.

In general, NCDP-1M has significantly increased the awareness among the society by collaboration of various health programs throughout the past few years. However, establishing awareness aspect is the first step and this alone is not sufficient to efficiently encourage NCD prevention in Malaysia. Further improvement steps should be taken by analyzing the emerging issues (postmortem analysis) on the current implementation to rework the model or structure of the program so that it can be apply on the next coming project.

4. Proposed Solution/ Initiatives

The main framework of our proposed solution is the schools. We are targeting the school students to spread the awareness because we believe NCD awareness should be applied as early as possible. Schools are considered as ideal settings to model, promote and reinforce healthy behaviors among children and adolescents. Children and adolescents spend much of the daytime at school and can easily access the schools' health-related educational programs. Therefore, schools function as health hubs by educating and delivering healthy habits among students as they service a large population of children and adolescents. Evidence suggests that school policies can positively impact Body Mass Index (BMI), physical activity and dietary behaviors among children. To make the implementation of this framework more solid, we choose to narrow down the targeting possible framework environment to Physical Education (PE) subject. As we all know students learnt a lot of things in school, and their schedule is quite pack. It is not ideal just to create a new slot for NCD prevention and sacrifice any other subjects or activities. However NCD issue is not a new topic to be introduced to the students, it is closely related with general health and fitness topic that the students usually learn in the PE subject. The idea is that this framework will integrate with current PE subject syllabus and not totally changing it to a new subject. The figure below will show the overall look of operational framework for proposed solution.

Based on the figure, there are three users for this plan, the PE teacher, students and parents. The ideal schools to get involved are the public primary and secondary school which includes the age of 7 years old until 17 years old. There will be four main modules inside this framework, Students Health Management System module, Health and Fitness Apps module, Health Education through Blended Learning module and Fitness Training module.

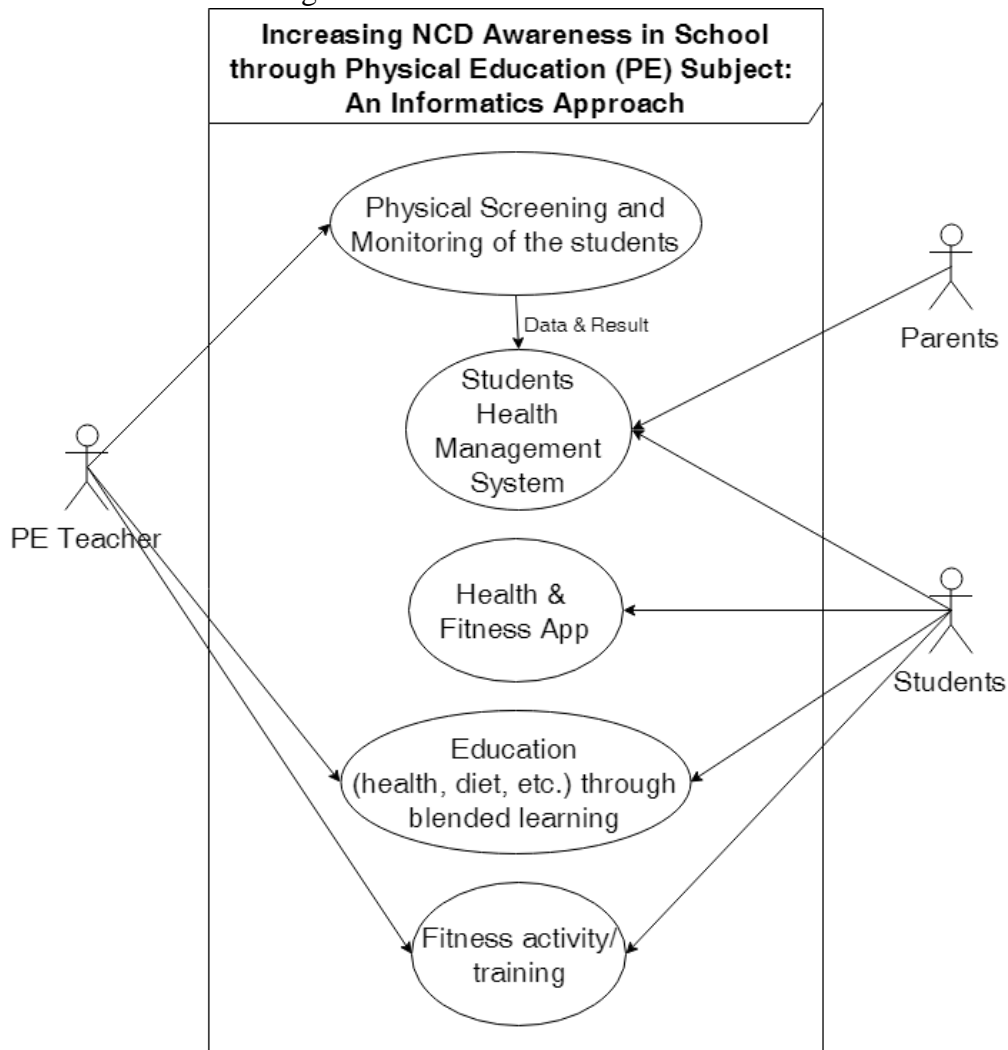


Figure Operational Framework

The first module is the main module for this framework. The school involved with this proposed solutions will installed a Students Health Management System in for their school. Student Health Management System provides the entire history for each student including medications, allergies, doctor's visit and other health concerns. The system also will allow the PE teachers to key in students' physical screening data such as weight, height, BMI and such. The idea is to have the PE teachers to take students health reading periodically. This will allow the monitoring of the student's health. The system will also allow the parents to view their child's health report. This is to create the awareness and sense of responsibilities towards

students' health. The figure below show a suggestion use case for Students Health Management System.

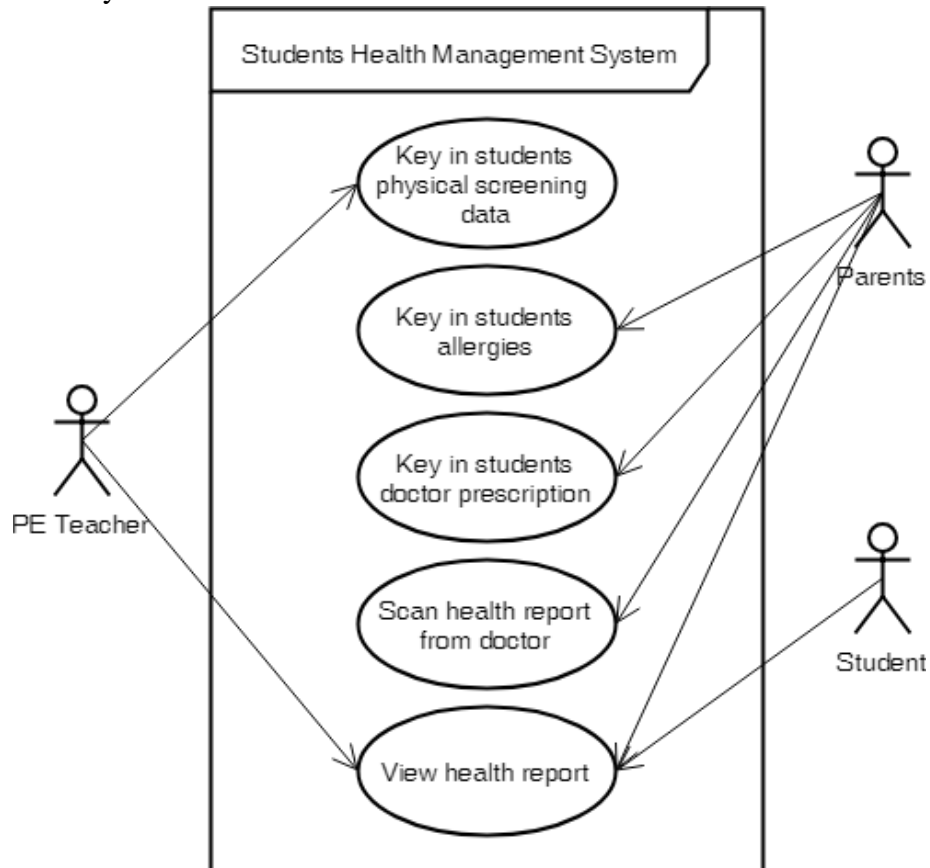


Figure Students Health Management System suggested Use Case

The second module in this framework is Health and fitness app. There is a lot of health and fitness apps available free for everyone. Most of the students nowadays have their own smartphone and why not use it for something good instead of only installing games. Study shown with fitness apps, it keep the students motivated to move and stay in track. With the help of encouragement from peers, the process of maintaining healthy lifestyle make easier. The school can play role in making sure the students install and conducting a sharing session to make sure the students are consistent using the apps. For schools that have more budget or students with higher household incomes, can enforce the use of fitness smart wearable device to keep track of fitness. Steps count is the most basic function in any fitness apps. The school can conduct a contest to see who can achieve their weekly or monthly steps count goals. This will increase the motivation of the students in keeping their healthy lifestyle. Some apps allow user to make groups or add friends' functions. With this function, school can organize a group and add the class. With this, school and parents can monitor the students' achievement using the apps. There are a lot more benefit in terms of variety of functions, keeping students' motivation, fun way to maintain a healthy lifestyle with using fitness apps.

However, to enforce the use of apps and controlling students' personal data using commercial apps is something to be further discussed. Unless we are talking about developing dedicated apps for this framework, there will be no issues to be raised.

We must not forget the knowledge part of health education. There is NCD awareness campaign conducted by the school once a while by giving health talk to the students. The frequency of health talk determined the health awareness within the students. The issues now is how often health awareness talk was held within a school year? Probably just one or two and sometime it is depends on the case aroused. In this proposed solution, we are trying to embed the awareness to take care of one health in the students' heart. We are also trying to make the students unconsciously making it as a habit to maintain their healthy lifestyle. So to achieve this, we need to keep reminding the students what, how and why do we need to live healthily. The new syllabus of the PE subject will be integrated with the current syllabus to strengthen the effectiveness. To fully utilize the technology and increase the effectiveness of learning session, the approach that will be taken is blended learning. Blended learning is where class will be conducted both face to face and online. Blended learning has been a popular trend nowadays in education institute both in secondary and tertiary level.

Finally, PE would not be complete without physical trainings. Physical inactivity is the term used for not achieving the recommended physical activity for health. It is one of the major risk factors for non-communicable diseases (NCDs) which ranked as the fourth leading cause of death in the world. It is become pandemic and a major global public health problem that needs urgent actions. Inactive peoples are 20-30% times more likely at risk of death as compared to active ones. Evidences showed that 1 in 4 adults in the world are inactive. Globally, greater than 80% of adolescent population is physically inactive. About 9% of all deaths recorded in the world are due to physical inactivity. This showed that physical inactivity adds a greater burden to NCDs and pre-mature mortality. Physical activity is any body movement takes place by skeletal muscles that can expend more energies as World Health Organization (WHO) defined. It is a broader than exercises and physical fitness. Physical activity can be done in all age categories (from womb to tomb). It is not necessary requires special sport equipment, clothes and shoes. Engaging in physical activity is easy, cheap and do not take much time. So, we can easily accumulate few minutes of recommended physical activity every day across the lifespan.

5. The Evaluation The impact of this solution can be categorized into three, from the students' perspective, teachers' perspectives and Ministry of Education perspective. The impact that will be discussed involved the benefit and the challenges that will be undertaken. We will also see these impacts both on positive values and negative values of the proposed solution.

There are a lot of benefits that students will gain from the proposed solutions. Students will practice a healthy lifestyle and be aware of the NCD risks. Students will also learn how to prevent NCD with a proper diet and health care that should be taken. Students will be aware of their health condition through the health screening and monitoring. The most important part is students will be motivated to keeping and maintaining the healthy lifestyle with the support of school and peers. This proposed plan will be a good approach to make sure Malaysian citizen living a healthy lifestyle to prevent NCD by cultivating the healthy lifestyle from young. Not only the students will be benefitted by this proposed solution but so does the country overall.

From the teachers' perspective, we must say that a lot of changes from current work will get involved. The syllabus of PE will change and so will the methods of teaching. PE teacher will be no longer conducting the class alone, but need to measure the health of students, control it and monitor them. It does change the role of the PE teachers. From the proposed solution evaluations feedback that was conducted for this study, most of the evaluators are concerned about the workload of the teachers. The concern includes the original PE syllabus that will be integrated with the new proposed solution might increase the time needed to finish the syllabus and it might not be logical.

As for the Ministry of education whom will indirectly involve, they will be the one who need to integrate this proposed solution with current syllabus. A proper planning and standard of procedures need to be produce as a guideline for the stakeholders. The biggest concern about this proposed solution towards the ministry is the cost that will be involved. Is there any allocation dedicated for this and if no, how can they proposed to allocate? How much should they allocate? Then a new budget needs to calculate for this implementation. This concern have been voice out by our evaluator and it is an acceptable concern. We cannot ignore the fact that this plan comes with price to be executed.

As summarization from the feedbacks regarding the proposed solution, we can conclude that the concern is about feasibility of the proposed solution. We do understand the concern that has been stated and acknowledge it and it was in our consideration while planning this proposed solution. The implementation period of the proposed solution in this study was not mentioned. The proposed solution itself is actually a big plan which cannot be implemented 100% immediately. What we suggest in the proposed solution is the activity and approach that should be taken in the order to increase the NCD awareness among school students. As a conclusion regarding this proposed solution is we can implement it stage by stage accordingly.

6. Conclusion

NCD preventions efforts have been conducted in Malaysia by the Ministry of Health. Even so, the awareness of NCD is still not strong enough as the number of

NCD rates are still increasing throughout the year in Malaysia. A solution has been proposed in this study to targeting the school students for awareness program. The framework for this solution is the PE subject in school. PE teachers, students and parents will involve as a user for the Students Management Health System that will store the health data of the students. PE teachers play important roles in conducting the whole program as a coach for healthy lifestyle. This framework consist of four modules including screening and monitoring students health via system, usage of fitness apps, health theory lesson thru blended learning and fitness training. The proposed solution feasibility is still in question but the main idea of this solution is the activity or task involved in it. We do believe the proposed solution can give a big impact in increasing the NCD awareness among Malaysian itself.

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