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E-Dash to Success

Diagnostic Curriculum Assessment Framework for Early Intervention of 'At-Risk' Students

October 2020

E-Dash to Success

Overview

Implementing Institution(s):	Institute of Technical Education, Singapore
Localities where practice has been implemented	ITE College West, School of Electronics & Info-Comm Technology (SEIT) for the following courses: *Nitec in Security Technology* and *Higher Nitec in Security System Integration*
Timeline/ Years:	2013 - Present
Target Group:	Annually about 240 students from Nitec in Security Technology and 100 students from Higher Nitec in Security System Integration
Total cost in-curred/resources required:	**Hardware:** Tablets/Smart phone and PCs/Laptops (using existing tablets/smart phones of students and PCs/ Laptops from school or students) **Software:** ITE's Blackboard Learning Management (LMS) platform (MyConnexion)

BACKGROUND

At-Risk Students in TVET

The Future ASEAN Agenda of TVET (Deutsche Gesellschaft fur Internationale Zusamenarbeit GIZ, 2019) reports that technical and vocational education generally bears a low public reputation among ASEAN member states (AMS). Students in technical and vocational institutions are associated with low-performing students and often at-risk of being left behind and consequently drop out of school.

This perception was true in the early days with TVET suffering from a negative image in most ASEAN countries, being associated with low status and second class to general education graduates. In Singapore, for example, the first secondary vocational school in 1964 was established for students who failed their primary school leaving examination and thus not able to enter academic secondary schools (Boon & Gopinathan, 2008).

While regional TVET rebranding efforts are underway to increase TVET's attractiveness to higher academic quality students, the success of TVET students need to be continually monitored, especially in terms of engaging and retaining at-risk students.

Monitoring Student Progress

Student academic progress monitoring could be implemented to ensure optimal retention of knowledge and skills. A Response to Intervention (RTI) approach, for instance, integrates assessment and intervention within a multi-level prevention system to maximize student achievement and reduce behavior problems (National Center on Response to Intervention, 2014)

Within an RTI model, using data to make decisions is important to address student needs in relation to positive post-school outcomes; such as academic skills, vocational skills, functional skills and career readiness (National Technical Assistance Center on Transition, 2018).

Curriculum-based Measurement (CBM) is an example of a commonly used data-driven progress monitoring method that is well-researched. Unlike classroom assessments

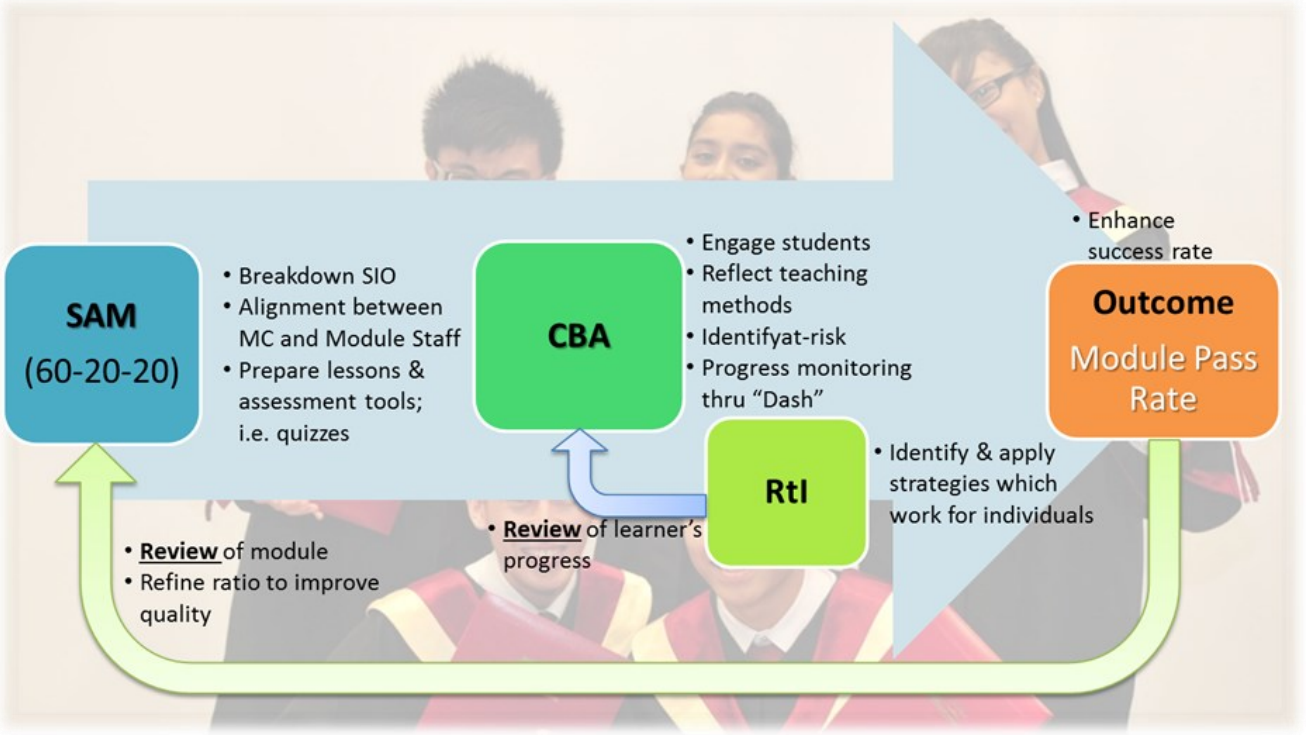


Figure 1: The DASH Framework

that test mastery of a single skill, each CBM assessment samples the year-long curriculum and, therefore, measures small student gains toward long-term goal (Clarke, 2009). Data gathered from the curriculum-based measurement can be used in pedagogical decisions as a response to intervention for at-risk student groups.

IMPLEMENTATION OF THE PRACTICE

DASH Framework

In Singapore Institute of Technical Education College West, the Course Manager from the Security Technology (SYT) Department in the School of Electronics & Info-Comm Technology (SEIT) led a team of lecturers and support staff to develop and implement the DASH Pedagogy Framework (*see Figure 1*). The goal is to improve students' learning outcomes and overall academic achievement via curriculum-based assessment, response to intervention and stochastic assessment.

Over an 18-week module, the module coordinator and lecturer will use a curriculum -based assessment (CBA) method to conduct formative assessments. Basically, the lecturer will engage students in pre-lesson assessment and post-lesson assessment for each new topic. In the DASH framework, printed question papers will be distributed by the lecturer, attempted by students, peer-marked manually, scores recorded and results analyzed in order to identify 'at-risk' students (*see Figure 2*).

Using the Response-to-Intervention (RTI) approach, lecturers identify strategies which work best for the identified 'at-risk' students; such as remedial classes, peer tutoring, using a different pedagogy approach and counselling. The goal of RTI is to prevent failures through early intervention.

The lecturer also periodically reviews the quality of module delivery using the Stochastic Assessment Model (SAM), by aligning the ratio of student learning

outcomes into "60-20-20". 60-20-20 refers to 60% of students being able to comprehend and complete the topical assessment questions, 20% of students being able to score better marks, and 20% of students being able to attain an 'A' grade.

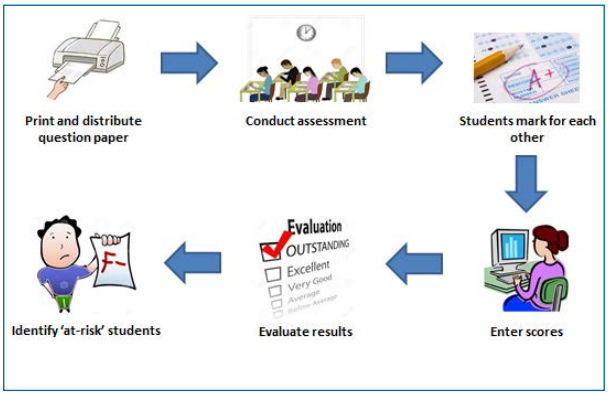


Figure 2: Curriculum-based Assessment in Response to Intervention (Manual Process)

eDASH Framework

The DASH framework improved the passing rate among the implemented modules.

However, the entire process was tedious; with lecturers spending approximately two hours to print and distribute each assessment, compile the results and analyse them manually.

The team thus innovated the DASH curriculum assessment and intervention into e-DASH using a dashboard system hosted on the institution's Blackboard learning management system *'MyConnexion'* (*see Figure 3*) for better efficiency, productivity, and sustainability.

The operational stages of eDASH are as follows:

Planning

1. The team reviews the current process, with improvements
2. Instructional designers in ITE Educational Design and Technology Division (EDT) design and set up the *MyConnexion* Blackboard learning management system
3. Instructional designers provide training to the lecturers on how to use *MyConnexion*
4. Instructional designers design and set up the data analytics system
5. Module coordinators prepare the course materials

Implementation

1. Module coordinators upload the course materials (notes, slides, quizzes) to *MyConnexion*
2. Module lecturers administer the assessments
3. Instructional designers and e-Education

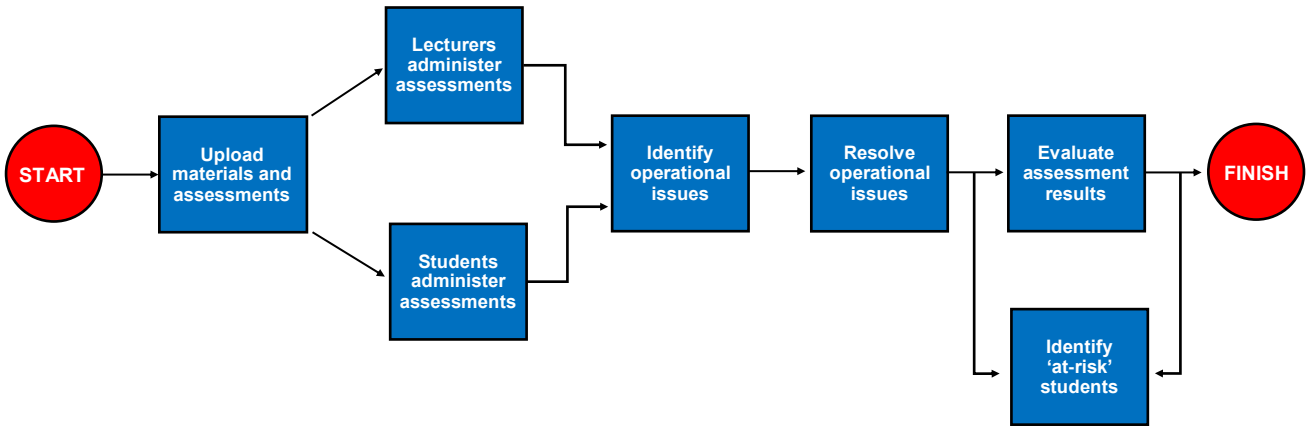
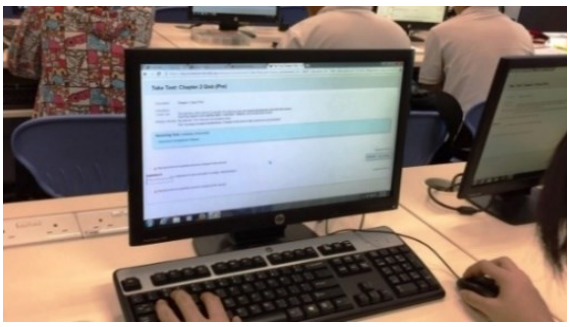


Figure 3: Curriculum-based Assessment in Response to Intervention (LMS Automated Process)



(a)

(b)

Figure 4: (a) eDASH online Assessment using the LMS MyConnexion; (b) Students participate in the online assessments

champions identify and resolve operational issues

4. Students participate in the online assessments (*see Figure 4*)

Monitoring and Evaluation

1. Module lecturers monitor the participation rate of the assessments
2. Module lecturers evaluate the assessment results
3. Module lecturers identify the 'at-risk' students (*see Figure 5*)

The Item Analysis feature in the LMS allows lecturers to identify the difficult questions and pay more attention to them. It can also randomise the questions to discourage students from memorising them (*see Figure 6*).

In eDASH, the lecturers conduct the assessments in a paperless manner using the existing PCs/laptops in the computer laboratories. For classrooms with no PCs/ laptops, the students can still complete the assessments using the Blackboard mobile app from their smartphones.

To implement eDASH for the modules, all lecturers are required to attend a 1-day in-house training at ITE Headquarters to learn how to upload the contents and assessments to *MyConnexion.*

The Management from each department appoints a lecturer to be the e-Education Champion to provide technical assistance to the rest of the lecturers in the department who may need help to create and upload the contents and assessments to *MyConnexion*.

All module lecturers are also encouraged to participate in a Professional Learning Community (PLC) to share their experiences and fine tune their lesson delivery to meet the learning needs of the respective students. Sharing and updates on new pedagogy and technology initiatives were also made during department meetings and small workshops (*see Figure 7*).

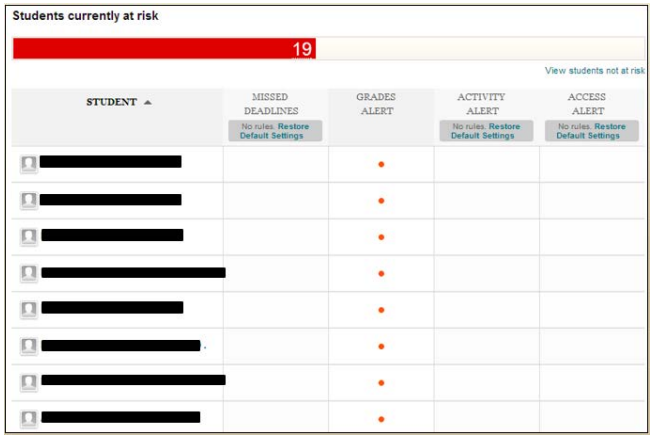
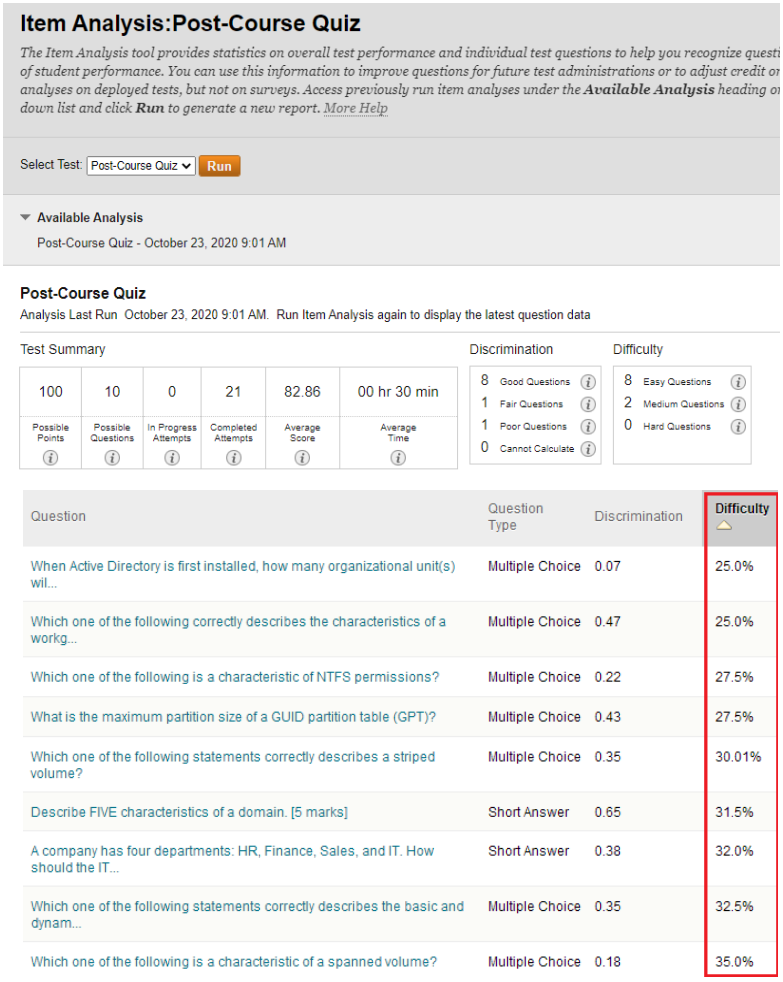


Figure 5: The List of 'At-risk' Students Displayed on the LMS Dashhboard



Item Analysis:Post-Course Quiz

The Item Analysis tool provides statistics on overall test performance and individual test questions to help you recognize questi of student performance. You can use this information to improve questions for future test administrations or to adjust credit or analyses on deployed tests, but not on surveys. Access previously run item analyses under the ***Available Analysis*** *heading o down list and click* ***Run*** *to generate a new report. More Help*

Select Test: Post-Course Quiz Run

Available Analysis

Post-Course Quiz - October 23, 2020 9:01 AM

Post-Course Quiz

Analysis Last Run October 23, 2020 9:01 AM. Run Item Analysis again to display the latest question data

Test Summary

Possible Points	Possible Questions	In Progress Attempts	Completed Attempts	Average Score	Average Time
100	10	0	21	82.86	00 hr 30 min

Discrimination

8	Good Questions
1	Fair Questions
1	Poor Questions
0	Cannot Calculate

Difficulty

8	Easy Questions
2	Medium Questions
0	Hard Questions

Question	Question Type	Discrimination	Difficulty
When Active Directory is first installed, how many organizational unit(s) wil...	Multiple Choice	0.07	25.0%
Which one of the following correctly describes the characteristics of a workg...	Multiple Choice	0.47	25.0%
Which one of the following is a characteristic of NTFS permissions?	Multiple Choice	0.22	27.5%
What is the maximum partition size of a GUID partition table (GPT)?	Multiple Choice	0.43	27.5%
Which one of the following statements correctly describes a striped volume?	Multiple Choice	0.35	30.01%
Describe FIVE characteristics of a domain. [5 marks]	Short Answer	0.65	31.5%
A company has four departments: HR, Finance, Sales, and IT. How should the IT...	Short Answer	0.38	32.0%
Which one of the following statements correctly describes the basic and dynam...	Multiple Choice	0.35	32.5%
Which one of the following is a characteristic of a spanned volume?	Multiple Choice	0.18	35.0%

Figure 6: Online Assessment and Identifying Difficult Topics using the Item Analysis Feature in MyConnexion

Figure 7: Professional Learning Community (PLC) Sharing And Update Sessions

IMPACT OF IMPLEMENTATION

The implementation of DASH framework saw the passing rate of the Analogue and Digital Electronics module increase from 86.7% to 94.4% and the passing rate of the Mathematics and Computing module also increased from 79.7% to 95.4% in 2013.

The implementation of eDASH framework starting in 2015, also saw continuous improvement in higher passing rate from 2015-2017 for the Wired and Wireless Network module (*see Figure 8*).

The general achievement, as measured by average marks, also improved (*see Figure 9*).

The eDASH process increased the efficiency in administering the assessments as:

1. The module teachers no longer need to print and distribute the assessment papers
2. The data analytics software is able to process the results and generate the list of 'at-risk' students automatically
3. The students and lecturers have quick online access to *MyConnexion*
4. Students are able to determine their scores immediately after each attempt
5. Students are able to see the correct answers immediately after each attempt
6. Module lecturers need not print and distribute the assessment papers
7. Marking of assessments and processing of results are error-free

As the total time to administer each assessment since transformation to eDASH has been reduced from two hours to thirty minutes (*see Figure 10*), module lecturers can also use their time productively to monitor student progress and identify the list of 'at-risk' students as displayed in a graphical format on the *'MyConnexion'* learning management system, subsequently planning early intervention strategies to facilitate improved student success rate.

The eDASH innovation was recognized as a creative program application that led to increased retention, increased completion, and improved outcomes through the implementation of new academic or administrative resources, data analytics solutions, intervention strategies, and student support programs through the Blackboard Catalyst Award in 2017.

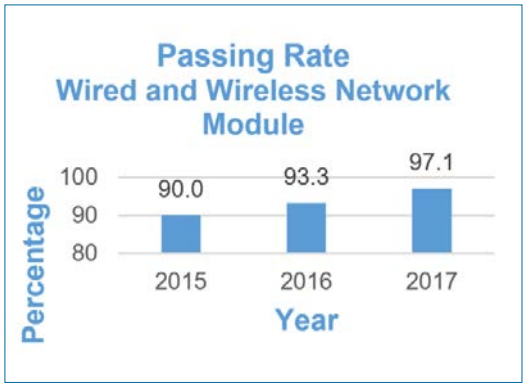
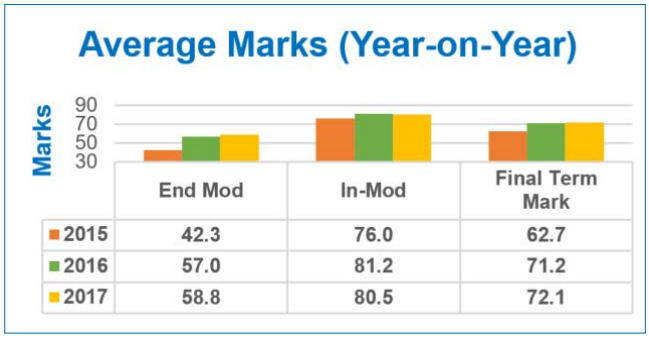


Figure 8: Improvement in Passing Rate



	End Mod	In-Mod	Final Term Mark
2015	42.3	76.0	62.7
2016	57.0	81.2	71.2
2017	58.8	80.5	72.1

Figure 9: Improvement in average marks (year-on-year)

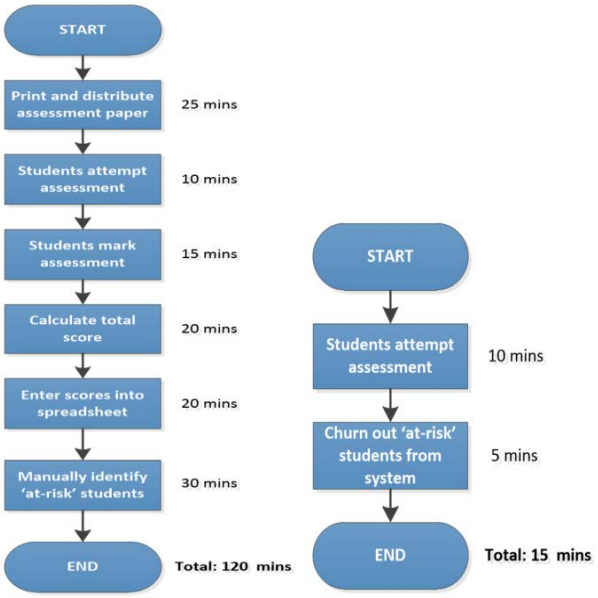


Figure 10: Time efficiency in eDASH transformation

LESSON LEARNT

The eDASH online adoption process may require additional training time, to help lecturers who are not IT-savvy gain confidence as they would also need to train their students on the online assessments procedures.

IT support and pedagogy training from teacher leaders or instructional designers, such as from ITE Educational Design and Technology Division (EDT) was instrumental to bridge the adoption curve. The educational design and technology team has to be available to facilitate queries or requests with regards to the learning management system.

The EDT team also were responsible to refine the features of the dashboard platform such as to display uploaded assessments results and the list of 'at-risk' students to a shared portal and make them accessible via a web browser.

In terms of use of devices to conduct assessments, lecturers could be flexible in the use of PCs, laptops or even mobile phones. When

PCs or laptops are not available during theory lessons, the management made provision to conduct assessments in the computer laboratories during the practical lessons. Subsequently, EDT launched the Blackboard mobile app for students to view the training materials and attempt the assessments using smartphones and tablets in the classroom.

Lastly, progress monitoring alone will not have a significant impact on student achievement. Lecturers must follow through the identification of at-risk students and modify their instruction based on what the data indicate.

REPLICABILITY

The rationalization of curriculum-based assessment practices to identify at-risk students for early interventional course of actions is at the core of the DASH framework and could be replicated either at the classroom level or as a holistic solution at the institutional level with the engagement of multiple stakeholders, to facilitate student progress monitoring.

As the proprietary Blackboard learning management system (LMS) is used to implement eDASH, institutions who are keen to explore the digitalized dashboard solution to improve its student success rate, but do not have the same infrastructure and hardware access, may consider other free open source LMSes such as Moodle or Canvas.

The data-driven diagnostic framework could be adapted using assessment data obtained from any free open source platform such as Google Sites or quiz tools such as Quizlet, where data are exportable for analysis.

Strong teamwork and collaboration between the module lecturers, class advisors, parents and students is required in the implementation of DASH or e-DASH.

The following process flowchart involving various stakeholders could be referenced as recommended procedures for replication (*see Figure 11*).

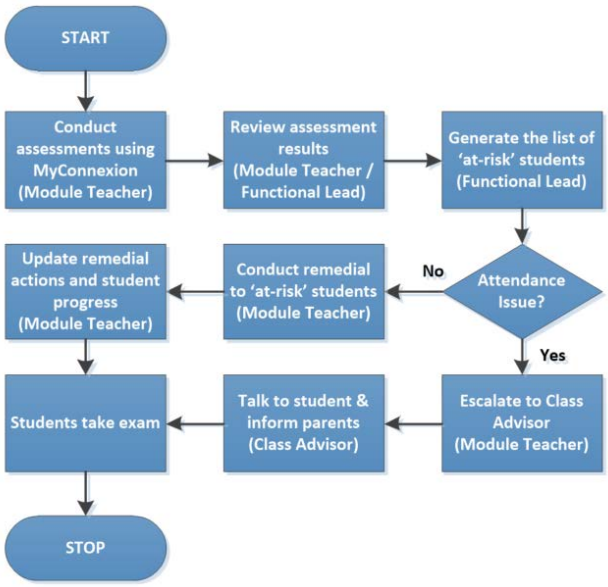


Figure 11: Recommended Procedures to Replicate DASH or eDASH

CONCLUSIONS

The implementation of eDASH at ITE College West, School of Electronics & Info-Comm Technology (SEIT), has streamlined the administering of formative curriculum-based assessments to identify 'at-risk' students for interventional response actions, enabling lecturers to monitor the progress of at-risk students, using a data-driven method.

Additionally, using an electronic platform (such as a learning management system) to collect, store, manage and analyse data has greatly increased the productivity of the module lecturers in administering the curriculum-based assessments and providing

early intervention to the 'at-risk' students.

Students find the online formative assessments useful for their learning as they are able to use the immediate results to determine the areas that they are weak in. The online assessments have helped the students to focus on their learning and see its relevance.

As a whole, eDASH as a curriculum-based interventional pedagogy strategy has potential to reduce school drop-out rates associated with low performance of at-risk disengaged students; enabling students to progress to the next level of education to eventually contribute towards labour productivity in the future competitive workforce.

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FURTHER INFORMATION

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