Journal of Contemporary Issues in Business and Government Vol. 27, No. 1, 2021
P-ISSN: 2204-1990; E-ISSN: 1323-6903
https://cibg.org.au/

Simple Student Grades Analytics Dashboards in Higher Education in Vietnam

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***Abstract**: In the higher education environment, tracking and analyzing student learning outcomes by subject is one approach to improving student learning outcomes in the next subjects. Large universities using the course management system could provide stakeholders with comprehensive assessments and data to review and assess student learning outcomes. There seems to be little such research at small- and medium institutions, in any case. This research suggests a simple method to design a dashboard that can be used by faculty and other university stakeholders to evaluate the learning outcomes of each subject. By using the information from the dashboards, useful advice and assistance are given to students. The most significant of this study is demonstrated a simple method to creating a meaningful dashboard. A score sheet is a unique input, and any faculty or staff can do it. A case study on a university in Vietnam also uses to illustrate management implications and development direction.*

Keywords: dashboard, student services, quality assurance, learning outcome.

1. INTRODUCTION

From the beginning of the COVID-19 pandemic, the higher education systems are overwhelming control due to isolation or quarantine (Hamidi, Sabouri, & Ewing, 2020). Traditionally, universities have focused on their business-side analytics departments to interpret and handle datasets because these datasets were directly related to government and institutional reports and to understand fiscal numbers (Baker & Inventado, 2014). Early efforts at universities had identified the need for an academic lens to incorporate student course activity into the right platforms that could provide feedback for teachers to improve engagement and ultimately minimize student attrition (Asif, Merceron, Ali, & Haider, 2017). One reason for this was that, at the surface, business needs and academic needs could seem similar, given that they both require metric design and analysis delivery through a platform (or dashboard) (Munguia, Brennan, Taylor, & Lee, 2020). However, the metrics and approach are fundamentally different for educational (e.g., student) data and business (e.g., financial) data, and the decisions made from these are different (Bunce, Baird, & Jones, 2017). Designing a suitable strategy that facilitates data used to inform teaching is not merely a case of building a new business reporting tool.

Nonetheless, many organizations commission their business intelligence or information technology services to design the strategy and platform without academic consultation (Munguia et al., 2020). When the approach comes from the executive, often the message gets diluted or does not align with academics' expectations, and such a strategy can become overtaken by a business. Some solutions have

been implemented to increase the effectiveness of university students learning (Shehzadi et al., 2020). In particular, building online learning platforms is the priority solution of universities around the world. Besides, analyzing student learning results is a popular method to help universities timely support students, to have better academic results. With reputable universities with experience and the ability to convert fast numbers, this is not a problem because they did it before the Covid-19 pandemic (Raza, Qazi, Khan, & Salam, 2020). However, while all these tools collect large amounts and diverse data, a lack of software systems can intuitively integrate that data and display information extracted from them intuitively. Meaningful and relevant to the needs of teachers and learning counselors. For small and underdeveloped universities, facing the transition from traditional to online learning and teaching is enormous pressure for both students, faculty, and managers (Patterson, 2020). The reason comes from the lack of experience in digital conversion, traditional paper management, or basic statistics. Also, stakeholders are limited to students' ability to analyze and design learning results in a professional and automated manner. To solve the above difficulties, the automated dashboard is a solution that can help universities solve the problem quickly (Fischer et al., 2020). Dashboards are seen as tools that aim to improve decision-making by directing cognition and capitalizing on human perceptual capacities (Mandinach & Jackson, 2012). However, despite the popularity of dashboards, little is known about their effectiveness, for example, the typology of feedback needed for different learning objectives, different students and a lecturer (Sedrakyan, Mannens, & Verbert, 2019).

This research aims to propose constructing dashboards that enable trainers and stakeholders to quickly build dashboards to support decision-based decision-making on the data better. Specifically, it is only necessary to use data on student learning outcomes. The experience and conclusions provided here interest researchers and develop dashboard practitioners aiming to learn analytics for higher education purposes.

2. BACKGROUND

A dashboard is a business instrument that gives a business consumer a series of metrics and other relevant information. The data is commonly depicted graphically and may contain the measurements involved in accomplishing organizational objectives (Pauwels et al., 2009). Typically, universities and higher education institutions are conceived of as sites from which knowledge and data are disseminated (Roberts, Chang, & Gibson, 2017). However, there is also a significant influx of data at these institutions from a business intelligence perspective. Many universities deploy business intelligence software to help navigate all these aspects and make the best use of available resources. University employees and managers will turn all their raw data into visually insightful dashboards using business analytics software (Baker & Inventado, 2014). The higher education areas such as academic affairs, enrolment management, and business affairs have recently experienced a surge in the use of these systems and measurements (Mitchell & Ryder, 2013). Besides, dashboard metrics in student affairs appraisal efforts are an up-and-coming trend (Hormigo, Rodríguez, & Baró, 2020). This trend towards dashboards consisting of core metrics have been motivated by increased demand for social transparency and comparability (Mitchell & Ryder, 2013). In addition to tracking progress on departmental targets or the strategic strategy of an agency, dashboard metrics will monitor progress on local, state, and national objectives (Heywood, 2000), offering a way of reporting to multiple departments on critical financing, retention, graduation, and accreditation initiatives. Unlike the business sector, which mainly focuses on financial metrics, "observation in higher education has generally emphasized those academically-related variables that are most easily quantifiable" (Shelton, 2010). Many programs depend on metrics such as grade point average (GPA) data, enrollment, number of credit hours, and involvement in programs or institutions, as well as non-academic factors such as return on investment, satisfaction with consumers and the workplace, and calculation of economic metrics. Dashboard metrics are maybe the simplest to gather and include information such as the number of students who visited a course or the numbers of employees who request about services (Alcorn et al., 2006). A well-designed dashboard

and adequate technological capability, though, will help to go beyond just counting and build a more precise and fuller image of evaluation and other facts. A more thorough review of existing related to the quality of student learning outcome assessment can be found in many previous studies (Radianti, Majchrzak, Fromm, & Wohlgenannt, 2020). It can be seen that the technological standard of technology is the subject of a vast number of publications that supporting the method of online learning (Liesa-Orús, Latorre-Cosculluela, Vázquez-Toledo, & Sierra-Sánchez, 2020). Service quality and support related to e-learning systems (Al-Fraihat, Joy, & Sinclair, 2020), training resources, and online course instructional design are also matters of concern (Baldwin & Ching, 2019), but there is less agreement among scholars, as studies are case-focused and findings are not generally applicable. It is an essential topic for preparing learners and lecturers to use the online learning system (Liaw, 2008), but very few scholars have discussed it. On the other hand, the absence of comparisons to more standardized and common performance indicators is a significant symptom of the low formalization of quality evaluation models in higher education (Sahney, Banwet, & Karunes, 2004). Especially, little focus is paid to constructing and developing detailed research and learning correctly. This has culminated in a significant disparity between large and small universities.

A myriad of problems and opportunities are presented by designing and integrating a dashboard framework (Sarikaya, Correll, Bartram, Tory, & Fisher, 2018). Challenges range from under-the-hood technical issues and data interaction to safety, defining the function of metrics (strategic, predictive, operational) to optimum dashboard architecture, to deciding how to respond to data from the dashboard (Sujaritha & Kavitha, 2020). The rewards or advantages of using dashboard metrics include real-time decision-making, predictive data usability, and the opportunity to report circumstances and validate operational functions and respond to institution stakeholders at the moment and in circumstances where it is beneficial to show results (Agasisti & Bowers, 2017).

3. METHODOLOGY

For this research, we propose a method based on five major stages (Fig. 1). The stages and steps proposed are:

(1) Scores sheet: This is created and released by the academic affairs office (spreadsheet file) that including the information about the class as the academic year, lecturer, student information, how the course will be assessed, etc. (see details in fig. 2). The lecturer will use this file to fill the assessments, the percentage of assessments, and the scores. In the first stage, we use data in this file to create the dashboard.

(2) Power BI Desktop: Power BI is a Business Analytics and Data Visualization platform that transforms data to dynamic dashboards, and BI reports from multiple data sources. Multiple applications, connectors, and utilities are supported by the Power BI suite - Power BI desktop, Saas-based Power BI service, and smartphone Power BI apps for various platforms. Market customers use such a collection of utilities to consume data and create BI reports. In this study, Power BI is used to extract, convert and load data and then produce score dashboards (Agasisti & Bowers, 2017).

(3) Load and Transform Data: Power Query has an enormous array of features devoted to cleaning and preparing the data for review to benefit consumers. Users can learn how to simplify a complex model, adjust categories of data, rename objects, and pivot data. Users can also learn how to profile columns to know which columns have the useful information for more in-depth analytics that they are searching for. We can use the results sheet that has been formatted as an excel file in this report—using data for pre-processing before loading for visualization tasks (Webb, 2014).

(4) Design Dashboard: Using Power BI to use scores sheet to build dashboards that can help users tidy, incorporate, recognize, and interpret data to increase organizational performance and encourage teachers to inspire student achievement. Consequently, administrators are left with a dashboard of

comprehensive, actionable data that can better monitor students' progress on the trail. (Ferrari & Russo, 2016) .

(5) Publish and Sharing: Users will also exchange the reports with other business users until the BI reports are generated on the Power BI desktop. All BI notes, dashboards, and results will be shared (Pearson, Knight, Knight, & Quintana, 2020).

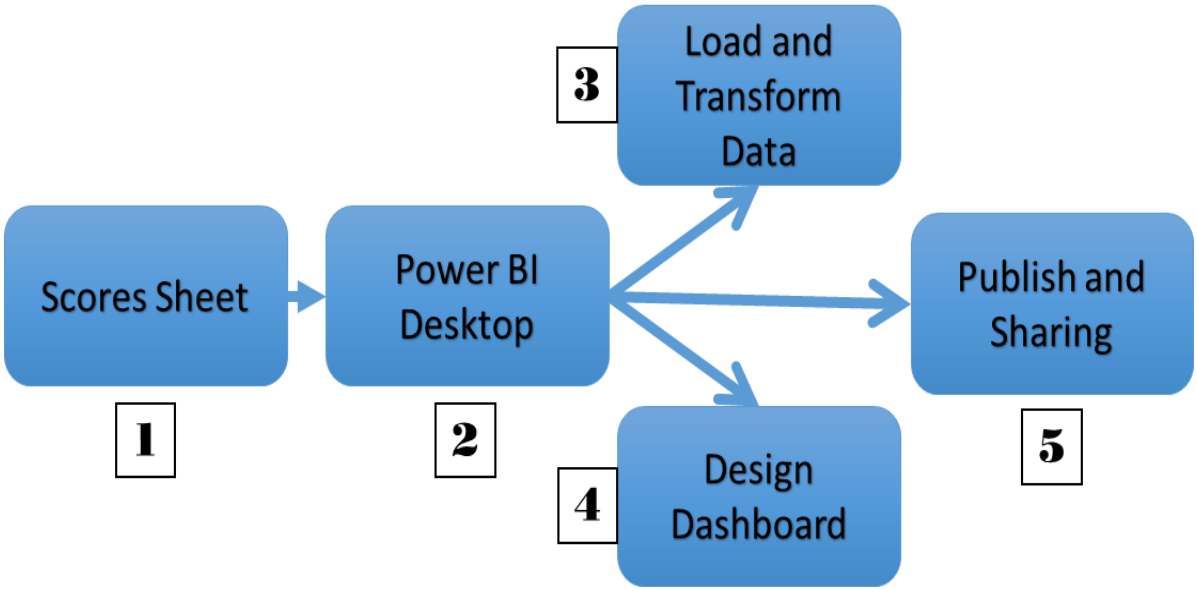
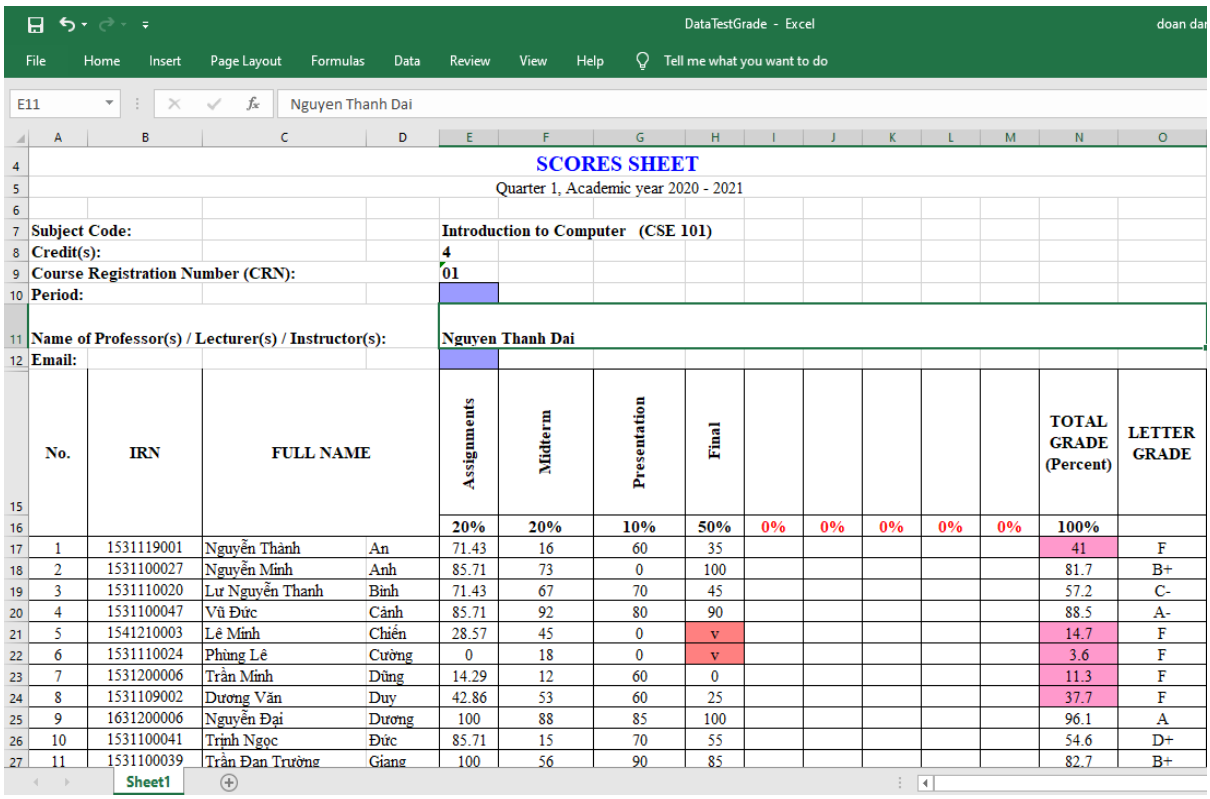


Fig. 1: Methodology stages and steps.



DataTestGrade - Excel

File Home Insert Page Layout Formulas Data Review View Help Tell me what you want to do

E11 Nguyen Thanh Dai

SCORES SHEET

Quarter 1, Academic year 2020 - 2021

Subject Code:	**Introduction to Computer (CSE 101)**
Credit(s):	**4**
Course Registration Number (CRN):	**01**
Period:	
Name of Professor(s) / Lecturer(s) / Instructor(s):	**Nguyen Thanh Dai**
Email:	

No.	IRN	FULL NAME		Assignments	Midterm	Presentation	Final						TOTAL GRADE (Percent)	LETTER GRADE
				20%	20%	10%	50%	0%	0%	0%	0%	0%	100%	
1	1531119001	Nguyễn Thành	An	71.43	16	60	35						41	F
2	1531100027	Nguyễn Minh	Anh	85.71	73	0	100						81.7	B+
3	1531110020	Lư Nguyễn Thanh	Bình	71.43	67	70	45						57.2	C-
4	1531100047	Vũ Đức	Cảnh	85.71	92	80	90						88.5	A-
5	1541210003	Lê Minh	Chiến	28.57	45	0	v						14.7	F
6	1531110024	Phùng Lê	Cường	0	18	0	v						3.6	F
7	1531200006	Trần Minh	Dũng	14.29	12	60	0						11.3	F
8	1531109002	Dương Văn	Duy	42.86	53	60	25						37.7	F
9	1631200006	Nguyễn Đại	Dương	100	88	85	100						96.1	A
10	1531100041	Trịnh Ngọc	Đức	85.71	15	70	55						54.6	D+
11	1531100039	Trần Đan Trường	Giang	100	56	90	85						82.7	B+

Sheet1

Fig. 2. Raw data

Table 1: Attributes and Indicators

No	Data	Meaning	Data type
01	Lecturer Name	Name of the lecturer	Text
02	Year	Academic year	Number
03	Quarter	Quarter	Number
04	IRN	Student ID	Number
05	Full name	Student Name	Text
06	Subject Code	Name and Code of the subject	Text
07	Credit(s)	The credits of the course	Number
08	Assignments	20% of final grade (0→100)	Number
09	Midterm	20% of final grade (0→100)	Number
10	Presentation	10% of final grade (0→100)	Number
11	Final	50% of final grade (0→100)	Number
12	Total Grade	Final number grade of students (0→100)	Number
13	Letter Grade	Final letter grade of students (A+ → F)	Text

4. RESULTS

We introduced two key contributions in this study: a simple framework for determining student learning outcomes in a subject and developing a dashboard prototype to represent the outcomes of implementing the system that is useful as a dashboard for higher education decision-making.

(1) Student Assessment Report: In this dashboard, the viewers can see the course's information and find the student user name or ID. Moreover, the dashboard shows detailed information about the grades of the student. The viewers can see the information via a table or charts with clear labels (see details in fig. 3).

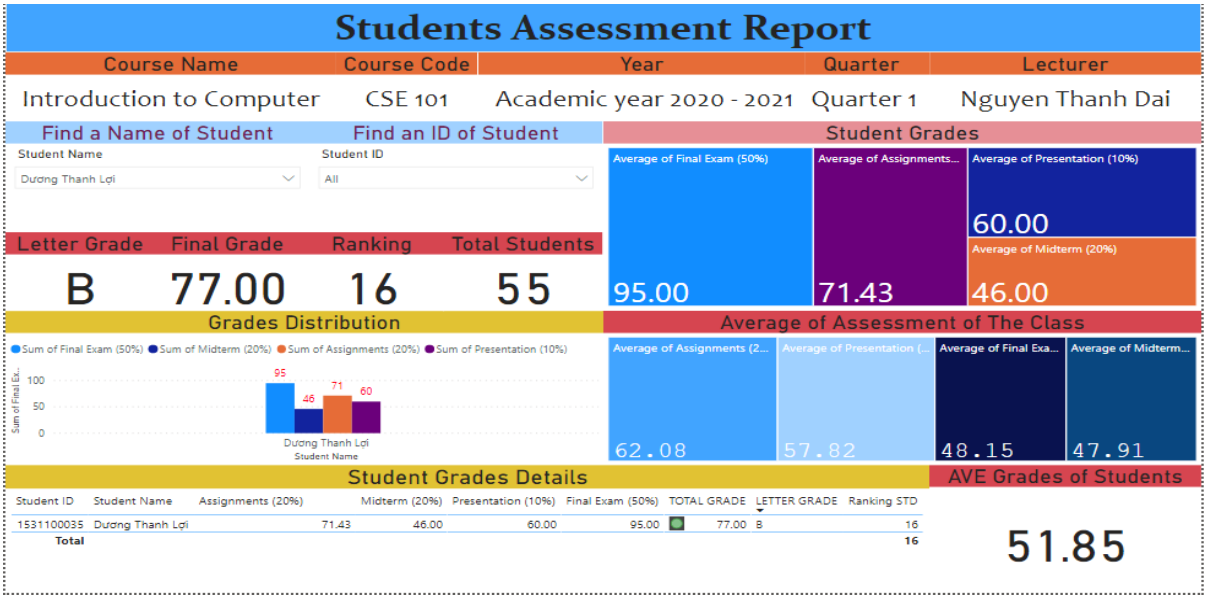


Fig. 3. Individual outcome report

(2) **Course Assessment Report:** In the second dashboard, the viewers can see overview information relating to the course and details information about the course grades in the course. The main difference between the two dashboards is the course assessment report dashboard helping the viewers who have the total view of the course's assessment. The viewers can especially use the Key Influence chart to help analyze the reasons for student grades (see details in fig. 4).

(3) Sharing the dashboard to stakeholders: Users of the student grade dashboard could post dashboards that proved to be incredibly successful when completed. They exchanged all the relevant services that were added to the dashboard while a user shared a dashboard. Power BI support publishes online all dashboards (see details in fig. 5).

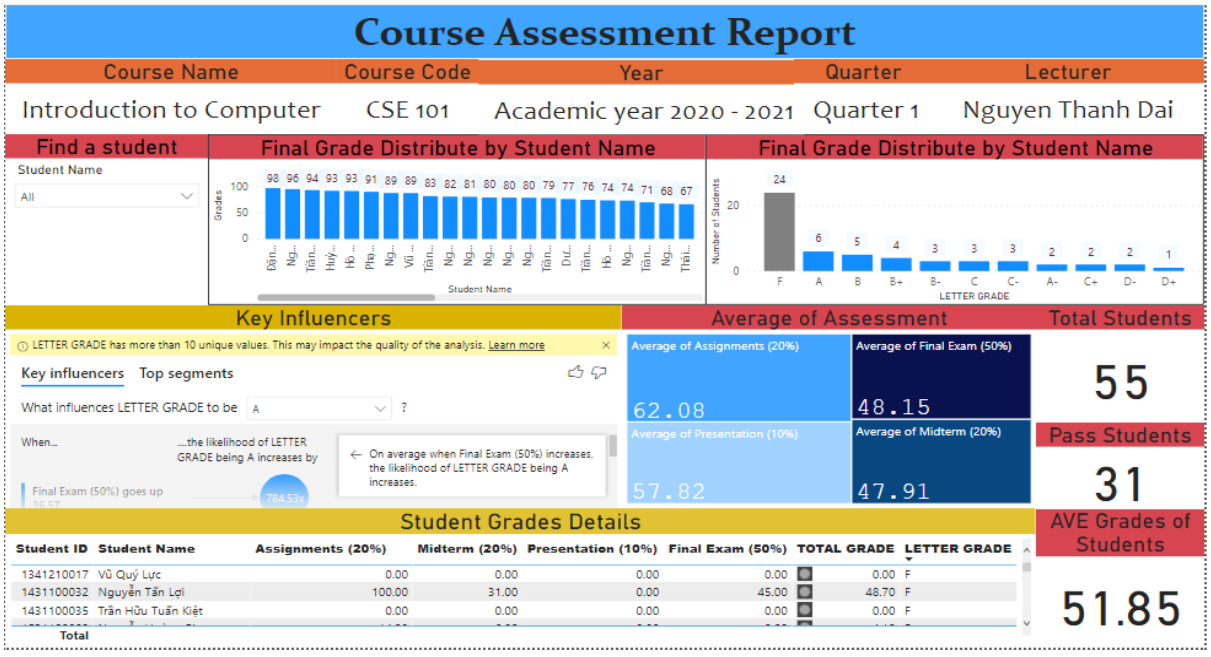


Fig. 4. Course outcome report

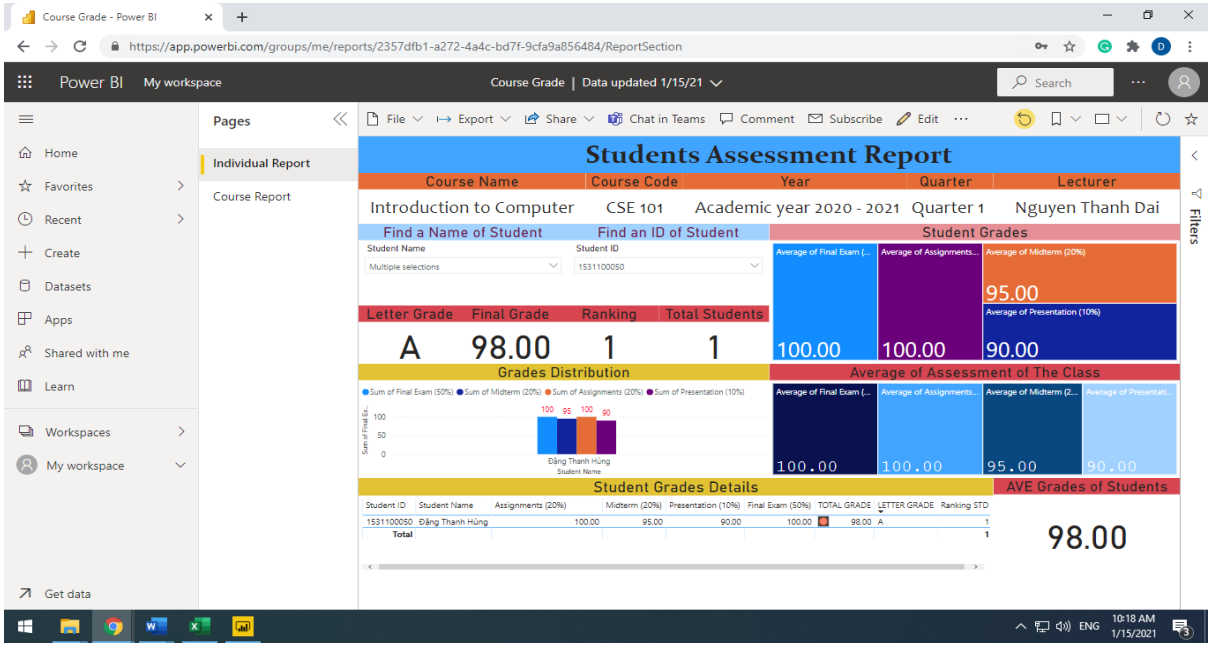


Fig. 5. Dashboard online sharing

5. DISCUSSION

The student outcome analysis dashboard allows lecturers and school administrators to track crucial metrics such as element grades, exam results, and other detailed information about students' grades (see fig. 3 and 4). These dashboards allow viewers to track students' grades with four different assessment criteria. The cards and tables display all information about the course, lecturer, students, and students' grades. In the other charts, the dashboard can help lecturer and school administrators quickly evaluate and make decisions by data-driven by visualization of these data.

6. CONCLUSION

Business Intelligence software, such as dashboards, helps an organization's workflow interact with enhanced data. An educational institution may either use off-the-shelf software available on the market, particularly in education or apply for services from a software development firm specialized in the production of data visualization solutions. Either way, such an approach would offer more analysis and allow student advancement to be better monitored. Detailed data analysis can be based on any decision that affects the institution's ordinary course of things. It should be possible for administrators to quickly access such metrics as student retention, academic success, graduation rates, and more. Efficiency can be dramatically enhanced by monitoring and continuously managing primary metrics gathered among various organizations.

The future research direction of this study should focus on (1) use all data from the curriculum to have an overview context of student outcome (Tomasevic, Gvozdenovic, & Vranes, 2020); (2) apply machine learning to analyze the data that can help to predict the outcome of students (Davis, Palincsar, Smith, Arias, & Kademian, 2017). The knowledge from analytical process support lecturer and school administrators making more accuracy decision.

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