Individualized Excel-Based Exams to Prevent Students from Cheating

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Abstract: The COVID-19 pandemic has brought a disruption to education, especially on how courses are delivered in higher education. Higher education providers are forced to go online, without considering the availability of IT infrastructure and capability of lecturers in delivering online courses. Since online learning is perceived as an opportunity for academic integrity breaches, academicians need to ensure that the learning processes prevent students from cheating activities, especially during the exams. This paper presents an innovative approach in delivering online, Excel-based exams which enable the lecturers to develop individualized exam questions. The accounting method and/or policy, as well as the accounting figures in the exams are automatically set based on the students' identification numbers. This program also allows automatic scorings for such exams. Based on the students' perceptions collected from the online survey, this type of exam was not considered complicated and somewhat reduced the cheating opportunities. Hence, it is suggested to use these individualized Excel-based exams in the future online exams to increase the exam's scoring objectivity and reliability scoring.

Keywords: excel-based exam, automatic scoring, accounting exam, individualized exam, accounting

INTRODUCTION

The Covid-19 outbreak with its massive challenges for human life brings disruptions which have never been predicted before. About 186 countries are affected, and one way to prevent further damage is by closing workplaces, shopping malls, and even schools/universities. Hence, like it or not, academicians are forced to adapt with the new ways of teaching through online learning. Consequently, teachers and lecturers should adopt the online flipping learning which combines the synchronous and/or asynchronous methods. These are expected creating flexibility and enjoyable learning experiences for students. However, some academicians are not ready to move their classes from offline into online learning environment. They merely change their classes from offline to online meetings via Zoom or any other video conference devices and in fact, this is a backward in education where the teacher-centered mode is re-used.

An accounting class is generally large. Hence, when it comes to exams, not only designing (Ashworth, Bannister, and Thorne, 1997; Doran *et al.*, 2011) but also scoring the paper-based exams bring pain to the lecturers (Bertheussen, 2014). For this reason, it is suggested to use an innovative way, such as using computer-aided assessment to reduce the workloads (Evans, 2013; Gikandi, Morrow, and Davis, 2011; Marriott and Lau, 2008). Although an accounting exam can be conducted online, many prefer to have a traditional type of hands-on exam for the security and surveillance issues (Rogers, 2006; Sindre and Vegendla, 2015) to minimize the students' cheating activities during the exam. It is admitted by the

students that cheating in an online exam is much easier (King, Guyette, and Piotrowski, 2009) unless the exam is well designed (Harmon, Lambrinos, and Buffolino, 2010).

During the pandemic, exams must be given online since conducting exams in offline classes are strictly prohibited by the law. In this online environment, lecturers must be highly creative in designing an individualized exam (Blayney and Freeman 2008; Nnadi, 2003) that no rooms for students to collude (Nnadi and Rosser, 2014). This paper aims at explaining an innovative approach possibly developed by the accounting lecturers to create the individualized excel-based exams to maintain the online exam quality and minimize the academic integrity breaches.

In the following sections, previous studies on online learning are presented, and exam designs are described. This also consists of problems, solutions, and scoring generating techniques. Next, students' feedbacks collected from surveys are presented. Conclusion and suggestions for future research are provided in the last section.

LITERATURE REVIEW

Online learning is actually not a new concept, as massive open online courses have been introduced a decade ago, allowing distance education. A good online learning should support the learner-centered approach to enable the students to interact with the others; and digest information as active learners who can logically adapt the knowledge transfer (Bento and Schuster, 2003). This online learning is more flexible than the traditional one (Herliandry *et al.,* 2020), where teaching and learning activities may be performed anytime and anywhere (Dewi, 2020) as less face-to-face interactions between students and facilitators (Sudiana, Fatah, and Khaerunnisa, 2017).

Some argue than online learning increases students' participations in the class (Saifuddin, 2018) because they are more confident and comfortable in asking or responding questions (Firman and Rahman, 2020). Furthermore, students become more independent in solving problems because they are asked to be more active in searching information related to the course (Firman and Rahman, 2020; Herliandry *et al.,* 2020). Although many support the online learning, some others criticize that online learning needs longer preparation time for the teaching and learning activities, considerably costly (Herliandry *et al.,* 2020), and may result in anxiety due to slow feedbacks given to the students (Pangondian, Paulus, and Nugroho, 2019).

Online learning also provides challenges for both students and teachers, one of which is due to the online learning infrastructure (Firman and Rahman, 2020). This online learning requires good internet access and gadgets (Bustomi, 2020), which are not always available (Dewi, 2020; Khasanah, Pramudibyanto, and Widuroyekti, 2020). Apart from the infrastructure, teachers/lecturers are also shocked as they have to master information and technology skills as online learning involves video conference and other learning media which force the teachers/lecturers to be more creative and adaptive in delivering the course materials (Bustomi, 2020; Djaja, 2016; Herliandry *et al.,* 2020; Sole and Anggraeni, 2018). With the minimum supports from schools or educational institutions, teachers and students are borne by the costs to access the online learning (Abidin, Rumansyah, and Arizona, 2020; Firman and Rahman, 2020; Herliandry *et al.,* 2020). Moreover, students also complain about their difficulties in understanding the course materials and completing the homework due to the communication barriers between the students and the teachers (Bustomi, 2020; Firman and Rahman, 2020; Juliane *et al.,* 2017). To minimize those challenges, teachers may adopt the project-based or problem-based assignments which require the students to search information related to the assigned projects (Abidin, Rumansyah, and Arizona, 2020; Chasanah, Khoiri, and Nuroso, 2016).

Although the learning is conducted through online platforms, the assessments must be able to measure students' performances. Assessments also serves as instruments to check the student's achievements, planned learning outcomes, feedbacks as well as the instructors' monitoring instruments (Born, 2003). Online exams can be set to maximize and fasten the teachers' scoring objectivity (Aripin, Silalahi, and Ulfa, 2020). It is expected that online exams possibly minimize the students' cheating activities. However, without proper planning, those will encourage the students to do more cheating

activities by creating notes, using gadgets to find the answers, or communicate with the others (Abdullahi and Mansor, 2015; Murdiansyah, Sudarman, and Nurkholis, 2017). The next section discusses the online exam designs to prevent from the students' cheating activities by providing the individualized excel-based exams.

METHODS

In the final exam of the Intermediate Accounting course, there were seven questions consisting of four conceptual and three problem-based questions to answer. The conceptual questions were set the same for all students. However, each problem was designed individually for each student, both related to the accounting method and/or policy choices as well as the numbers involved in the problems. Hence, an excel spreadsheet was used to automatically generate methods and numbers based on the students' identification number. Excel is an essential feature in accounting education (Beaman, Waldmann, and Krueger, 2005; Chandler and Marriott, 1994) that the accounting lecturers should have sufficient excel skills, especially in designing excel-based exams.

In this higher education institution where the exams were conducted, a student's ID has a 12-digit number, with some differences in the sixth and last four digits. Hence, the starting point to design an individualized exam was using those numbers with some excel functions to generate numbers. From those 12 digits, only five unique digits of each student were utilized instead of the last digit usually used to create a distinctive figure for each student.

Students were first asked to fill 12 digits of their student's IDs in the 12 cells. This ID was used to produce numbers and select the accounting method. To avoid incorrect input of two or more digits in a cell, data validation was set to constrain the number of only from 0 to 9[1]. The cells were also shaded with a bright green color to attract the students' attention. Instructions were clearly provided for the students to input 12 digits of their student's IDs in the bright green-shaded cells, while the notification of numbers and methods for each question will be different based on each student's ID (see Figure 1).

Figure 1. Instructions to complete the cells

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[1] To do this, click on Excel Ribbon: Data – data validation - whole number – minimum 0 – maximum 9.

Students were then classified into the odd or even group. This classification was to decide the accounting method used in solving the problems. Hence, the Excel's MOD function was used with the last digit of student's IDs as the number and 2 as the divisor[2]. There were two outcomes: 1 and 0, with 1 represented the odd group (Group A), and 0 represented the even group (Group B). This formula was then combined with the IF function to provide notifications for those students whether belonging to Group A or B (see Figure 1). This group needs to specify the students' answer sheets. For example, students were asked to make journal entries either for the lessee (Group A) or lessor (Group B, see Figure 2). IF function was used to assign which method should be conducted by the students.
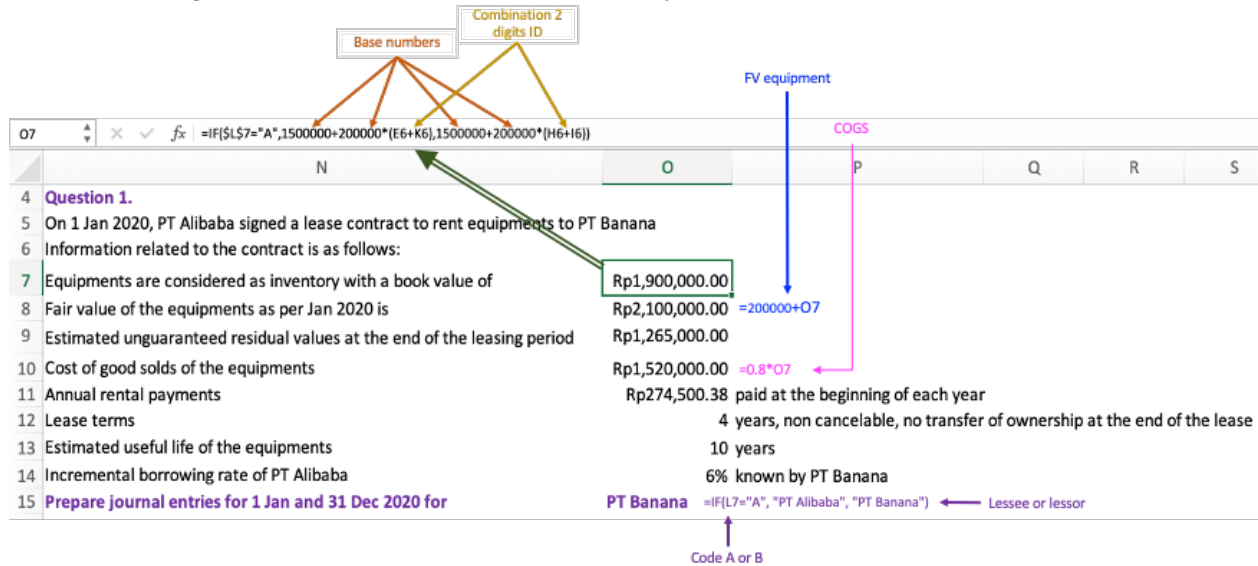

Figure 2. Sample questions and formula

Prior to assigning numbers, a base number was set and then the IF function was used to assign the unique numbers to each problem provided for the exam (see Figure 2). As previously explained, only five numbers are unique to each student (6th, 9th, 10th, 11th and 12th), and then the combination of 6th and 9th with 10th to 12th were used to set figures in the questions. For instance, continue the lease problem. The first value was set for the leased equipment's book value. It was set as a combination of question codes and base numbers, added with the multiplication of student's ID. The second value was set for the equipment's fair value of IDR 200,000 higher than the equipment's book value. Next, the cost of goods sold was set 80% of the book value.

In this type of problem, the lecturer needs to be careful in determining the lease terms and estimated useful life as the results are in different leasing types; capital lease or operating lease. The next step, the lease terms (in cell *O12*) were then set by using IF function. The last digit of student's ID (in cell *L6*) was used to create a different length of lease as follows:

=IF(L6=1,3,IF(L6=2,4,IF(L6=3,5,IF(L6=4,5,IF(L6=5,5,IF(L6=6,8,IF(L6=7,9,IF(L6=8,10,IF(L6=9,11,12))))))))) ……….. (in cell *O12*)

After determining the lease terms, the estimated useful life of asset was determined from cell *O12*:

=IF(O12=3,9,IF(O12=4,10,IF(O12=5,8,IF(O12=6,7,IF(O12=7,8,IF(O12=8,8,IF(O12=9,11,IF(O12=10,12,IF(O12=11,12,12))))))))) ……….. (in cell *O13*)

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[2] At the target cells type =MOD(L6,2) with L6 is the cell containing the last digit student's ID.

In determining the incremental borrowing rate, the second last digit used was:

=IF(J6=1,7%,IF(J6=2,6%,IF(J6=3,5%,IF(J6=4,8%,IF(J6=5,9%,IF(J6=6,10%,IF(J6=7,11%,IF(J6=8, 4%,IF(J6=9,12%,13%))))))))) ……….. (in cell *O14*)

Once the lease terms, life of equipment, and borrowing rate were set, the estimated unguaranteed residual value could be calculated by using the following formula:

Residual value   = {depreciation rate x (useful life – lease term)} + base number

= {(book value / useful life) x (useful life – lease term)} + base number (1)

In the excel sheet, the formula was:

= ((O7/O13)*(O13-O12))+125000 ………... (in cell *O9*)

The last number was the annual rental payment. It was calculated with the following formula:

Annual rental payment = (fair value – PV residual value) / lease term (2)

In the excel sheet, the present value (PV) might be easily calculated that the annual rental payment (cell *O11*) became = (O8+PV(O14,O12,0,O9,1))/O12[3]. Lastly, the sheet was protected, and the formulas were hidden before distributing the exam[4].

In addition to the creation of exam's questions, the solutions to the problems were also designed in different Excel sheet. This scoring guide was purposively designed to make the exam scoring operate faster. The numbers in problems were connected with the solutions while the point for each correct answer was defined. Once student's ID was input to the solution sheet, the correct answer changed. This method enables the scoring to operate faster, although the students submitted the answers in the form of photo.

Exam Delivery

The exams were conducted in three classes at the same time and at the same date. The individual exam question was available sequentially in the e-learning (Moodle-based) platform at one specific time. Students could only see the exam questions at the set time. As many students were from rural areas where internet connection is somehow inaccessible and/or limited, the individual exam question is also sequentially sent via WhatsApp Group at the same time with the question appeared through e-learning. WhatsApp has been used as a means of communication in medical schools (Dar *et al.,* 2017; Willemse, 2015), engineering (Nitza and Roman, 2016), and education (Awada, 2016; Hamad, 2017; Mwakapina, Mhandeni, and Nyinondi, 2016; Susilo, 2014). This platform allows the students to have online discussions, while the teachers found it easier to deliver the online tutorials, learning materials, and assignments, including instructions (So, 2016; Susilo, 2014). Hence, it is not surprising that WhatsApp, including WhatsApp group, is very popular in Indonesia, although sometimes the participants send spams and hoaxes (Bouhnik and Deshen, 2014; Cetinkaya, 2017) while teachers should be prepared to spend time outside their normal working hours (Bouhnik and Deshen, 2014).

Each question had different points; a more complex problem had a higher score and took more time to finish. Hence, the time allocation for each question was set differently. Students were given a limited time to answer each problem. This information was sent to the students a week before the exam to have better preparation. Instructions of how to answer the exam questions and how to submit their answers to be marked was sent before the exam date. Since the students' typing speed could not be equalized, the students' laptops or PCs had different technical specifications, and based on the agreement with the students; the answers were paper based; one sheet for one question.

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[3] The formula to calculate this present value is PV (interest rate, lease term period, annual payment of 0, guaranteed residual value, and 1 for beginning of the year).
[4] Select all worksheets except for the green cells for the student's ID, right click, choose protection tab and then select locked and hidden. Next, click Tools in the ribbon, protection, and protect sheet. Fill in the passwords to lock the worksheet.

Once the students had completed one problem, they were asked to take a picture of each answer, scanned it, upload it either to the e-learning platform, or send it to the lecturers' WhatsApp numbers. Students were given five minutes after the exam ended to upload their answer sheets. After this upload time ended, the next question was then opened for the students.

These online exams were set to be invigilated. Hence, the students were asked to join the online classrooms via Webex[5] with mode-on video that the lecturers were able to see what the students did during the exam to prevent from the students' cheating activities. As previously explained, this excel-based exam is already individualized with each student receiving different methods and numbers. Hence, the online surveillance plus individualized-type questions are expected to reduce the cheating opportunities as the answers of each student are different from the others. The students' perceptions and feedbacks regarding to this online, individualized excel-based exam are further discussed in the next section.

RESULTS AND DISCUSSION

To measure the effectiveness, Qualtrics online survey was conducted to the students participating in this online individualized excel-based final exam after the final scores were announced (n=80). Each questionnaire consisted of 16 questions. Students were questioned related to their genders, final exam scores, 14 questions on the easiness use of this online individualized excel-based final test, and their reflections (Alsadoon, 2017; Deutsch *et al.,* 2012; Hillier, 2015; Özden, Ertürk, and Sanli, 2004), measured with the 5-point Likert scale. The survey was opened for a week, and 76 responses were collected. The students were further classified into high achievers (if the exam mark is more than or equal to 85) and non-high achievers (for those less than 85). For data screening, we checked the univariate outliers from the standardized value for each Likert scale item. We found three outlier cases, and these were then removed from the data for further analysis (Hair *et al.,* 2014), resulting in a 91% response rate. After removing the outliers, a normality test was conducted using skewness and kurtosis, and showed that all the data was normally distributed.

A principle component analysis (PCA) was then conducted on those 14 items with a direct oblimin rotation to classify the questionnaire into several factors and check the construct and discriminant validity. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis, with KMO = 0.753, and all KMO values for individual items were more than the minimum threshold of 0.5 (Field, 2013). Bartlett's test of sphericity with χ^2 (91) = 288.803 and p < 0.001, indicated that the correlations between items were sufficiently large for PCA. An initial analysis was conducted to obtain the eigenvalues for each data component. Five data components had the eigenvalues of more than one and in combination, explained by 69.56% of the variance. Table 1 shows the after-rotation loading factor. The items clustered in the same components suggested that component 1, 2, 3, 4 and 5 respectively represented the easiness, timeliness, self-efficacy, challenge, and integrity concern of the online exam. These factor scores were then used for further analysis.

Table 1. Factor loading for each item

Items	Easiness	Time lines	Self-efficacy	Challenge	Integrity
Applicable to other courses	.855				
Preferring the online to offline exam	.820				
The system is easy to use	.816				
Feeling Relax if future exam is conducted online	.767				
Recommending online for future exams	.744				
Online exams objectively reflect the students' performance	.518				

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[5] Webex is an online video conferencing platform.

Not feeling panic when doing the exams		.847			
Requiring less time finishing the online exams		.696			
believing of having enough competence			.693		
Not ashamed after finishing the exams			.649		
Feeling Proud after finishing the exams			.607		
Online exams are enjoyable challenges				.887	
Reading on screen adding no difficulties during the exams				.819	
Online exams reduce cheating opportunities					.995
Eigenvalues	4.258	1.654	1.479	1.321	1.026
% of variance	30.411	11.814	10.567	9.437	7.331
α	.869	.568	.562	.661	N/A

Based on those classifications, the descriptive statistical data were shown in Table 2. Although all mean scores were greater than 3, out of 5, the students relatively agreed that the online exam was technically easy to follow and appropriate to use for the future exams in other courses. In addition, students also felt that in the online exam environment, they believed that they had a higher competence and less panic. Hence, they felt that there was no feasible challenge when reading the questions on the screen instead of on paper. These positive experiences made the students preferred online to offline exam and agreed if the future exams will be conducted via online that they will feel relax. Students also considered that it was harder for them to do cheating activities during the personalized type exams were conducted. Hence, they believed that an online exam objectively reflected their performance.

Table 2. Descriptive statistics

Items	Min	Max	Mean	Stdev
Easiness				
Applicable for other courses	2	5	3.66	0.866
Preferring online to offline exams	1	5	3.39	1.054
The system is easy to use	2	5	3.71	0.769
Feeling Relax if future exam is conducted online	2	5	3.46	0.846
Recommending online for future exams	2	5	3.46	0.846
Online exams objectively reflect the students' performance	2	5	3.24	0.875
Timeliness				
Not panic when doing the exams	2	5	3.77	0.837
Need less time finishing the online exams	1	5	3.32	0.883
Self-efficacy				
believing of having enough competence	2	5	3.83	0.747
Not ashamed when finishing the exams	2	5	3.65	0.819
Proud after finishing the exams	2	5	3.34	0.899
Challenge				
Online exams are enjoyable challenges	1	5	3.30	0.922
Reading on screen add no difficulties during the exams	2	5	3.47	0.863
Integrity				
Online exams reduce cheating opportunities	1	5	3.35	0.952

Independent sample t-tests were then conducted to check the differences between gender and high achiever students based on five factors. On average, female students expressed the decreasing cheating opportunities (M=0.159, SE=0.963) more than male students (M=-0.505, SE=0.975). This difference[6] was significant with $t(65) = -25.399$ and $p < 0.05$; representing a medium-sized effect with $r = 0.29$. This finding implied that male students perceived that cheating opportunities during the online exams were higher than the female students did. This was probably caused by the female students' learning efforts were

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[6] For robustness check, a non-parametric test was conducted and showed similar findings (Mann Whitney U = 246; p = 0.017). There was no significant different between the high and non-high achiever students.

bigger than male students' (Dodeen, 2012), since male students perceived that cheating was more morally acceptable (Smyth and Davis, 2003). Although academic cheating activities happened more in offline classes than online environments (Watson, George, and Sottile, 2010), educators should take extra precautions when designing online tests, such as by designing subjective exams (essay questions) than objective measures (multiple choice questions).

CONCLUSION

This study aims at explaining the online exam methods in accounting subjects during the outbreak of Covid-19 pandemic. The exams are uniquely designed for each student to reduce cheating opportunities and relatively ease the scoring. This automatic scoring may improve the scoring process credibility scoring and minimize the calculation errors. From the students' feedbacks, it is shown that online exam is not considered as a burden and believed reducing the cheating opportunities during the exam. This personalized exam may be further developed in class practices where the students may directly answer the questions presented in the excel sheets with auto scoring feature. This may also be developed using the automatic feedbacks provided in the students' worksheets. Meanwhile, the problems arising in such individualized creating processes are related to the longer period of time, yet those considerably reduce the scoring workloads.

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