IMPROVING STUDENT LEARNING MOTIVATION BY BLENDING ONLINE LEARNING WITH ONSITE LABORATORY COURSE: CASE STUDY OF DIAMOND GRADING COURSE

A. Kiratisin
Srinakharinwirot University, College of Creative Industry (THAILAND)

Abstract
Diamond grading is a compulsory course of bachelor degree in gems and jewelry program, provided at College of Creative Industry, Srinakharinwirot University (Thailand). Since the first place, the practices of diamond grading skills and lecture have been given onsite by the lecturers. The learning outcomes of the course are to make students be able to grade the diamond in the right quality and to apply in their future career. However, students in the digital era are lack of motivation for lectures and repeating practices. Online learning approaches have been used in the sample class on the purpose to make students show more motivation and get better skills in diamond grading. The sample class has been voluntarily test the level of motivation and understanding the subjects by onsite teaching, comparing to the result after used the online tools blending with the face-to-face teaching. The result showed that students show more interesting in the subjects with online tools. Moreover, some students have showed interest in continue build up an online tools for gems and jewelry education.

Keywords: diamond grading, blended learning, online learning, mobile learning.

1 INTRODUCTION
Thailand is known to be the center of gems and jewelry production and trading. To improve the competitive capacity of the industry, Srinakharinwirot University (Thailand) was the first university of Thailand that has given gems and jewelry program in Bachelor of Sciences since 1992. In 2016, the program has been enhanced to the bilingual program. Then in 2017, a new college has been established, named the College of Creative Industry (CCI), on the purpose of improving the creative industry of Thailand and preparing for the digital era. The college is composed of 3 sectors which are jewelry, fashion and product design programs. Therefore, the gem and jewelry program has been attached to the CCI since then. In consequence, the competency of students in the program have been re-designed as a “ready-to-work” person with innovative and entrepreneurship skills. All course given must be improved the learning and teaching methods for students to achieve the expected competency.

Gem Identification Laboratory III (Diamond grading and appraisal section) is one of the compulsory courses in the gems and jewelry program. The former course outcome was that students should be able to appraise a right quality of diamond as a diamond lab grader. However, the ability to work in diamond jewelry career section has been added in the updated course outcome. Since the original of the program, the lecture and onsite practice based were used as the teaching approaches. Students might achieve the diamond quality grading in worksheet at least 12-15 diamonds per semester (about 4 hours per time and 15 times per semester), following the 4 mains criteria (4Cs) which are Carat weight, Color, Clarity and Cutting quality of diamond. The class then faced the problems since the students could not be able to align their comprehension to the lecture given, especially, the problem to identify the type of inclusions in the diamond samples. Some of them were neither capable to analyze the clarity grade, nor to plot the inclusion types in the grading worksheet. In addition, repeating of grading practice for long period was boredom for students. For these reasons, some students showed less enthusiasm in the subject. To enhance the students’ leaning quality and motivation, the blended learning method has been applied to the diamond laboratory course given in second semester of 2018 academic year. The face-to-face and online methods have been designed and weighted the proportion in the course planning. The online elements applied in this course were the website, chat application (LINE application) and Google Classroom. The purpose of this study is to find the suitable instruments that would motivate students in the digital era to learn and achieve the course learning outcomes. With online elements, we expected that students, at their own pace and convenience, would adequately align their perception of diamond quality grading and be able to apply in their future career.
2 METHODOLOGY

This study was comprised of 26 students, which one was foreign exchanged student, who enrolled in Gem Identification Laboratory III (Diamond grading and appraisal section). They all have had their experiences in Gem Identification Laboratory I and II, which trained in gemstones identifying and were given in lecture and onsite practice based. This implied that the target population for the study is able to compare the different between the onsite and online teaching methods.

Background and needs of students in gemology courses collection data, problems analysis, course and blended learning method designed and the target population’s opinion survey are the methodology used in this study (Fig. 1).

Background and the students’ need for the diamond grading laboratory course has been collected by using Google form, as it is familiar to all students. The questions in this questionnaire have been designed in 1 to 5 scale rubric score. The questions were comprised of 4 parts: 1. the background on gemology courses of the target population; 2. the opinion about the teaching methods that most understanding and helpful to identify or grade gemstones/diamond; 3. The preferred methods used to make decision on gems identification or diamond grading; and 4. Expecting on the online media applied in gemology courses: case of the diamond grading. The result from the data collected, shown needs and problems of students, has been analyzed and used to designed and weighted for the proportion of face-to-face and online methods.

Then, the blended leaning method has been applied into the course. The face-to-face methods were the lecture based and onsite diamond grading practice. The online elements used in this study were website, LINE application and Google Classroom. The various websites was used for the problem based study. The objective of learning from website was to embed lifelong learning skills. Students should be able to analyze the credibility of the website, to augment their search and enlarge their knowledge, finally, to systematically present their learning to the study group. LINE application, by creating a group for the classroom, is a prompt tool by which the study group could either share their study cases instantly in the class or keep for later study. Google Classroom is, however, main element for the course where all course materials and media have been uploaded and shared with students. In addition, online quiz have also been experienced. Google form has been repeated to collect the data of students’ opinion related to the blended learning method applied in diamond grading laboratory course and the motivation of learning.

3 RESULTS

3.1 Background and needs of students in gemology courses collection data

The 26 target students in this study has been previously passed all gem identification I and II courses. They have weighted the opinion about the teaching methods that were the most understanding and helpful to identify or grade gemstones/diamond. The rubric scores described here are: 1 Never been

---

Figure 1. Study methodology and the instruments used in the blended learning of diamond grading laboratory course.
taught by this method, 2 Unable to understand the courses by this methods, 3 Just good for some topics, 4 Help for more understanding and 5 Most understanding and useful methods. The result from the survey is showed in Fig. 2. The outstanding approaches that most of target students scored for “Help for more understanding” were Class lecturing, Learning by doing (lab class), Discussion problem or case study in class, Personal training or teaching in class, Share knowledge or experiences in online media and Mix both in class and online methods are scaled as. However, they scored that Research or report assignment, Quiz or test, Demonstrate lab / Clip VDO and Learning from online media (line, internet and application) would be “Just good for some topics”. There was no target students decided any method should be the most understanding.

![Figure 2. The teaching methods survey result.](image)

The target students preferred to use several tools for making decision on gems identification or diamond grading (Fig.3). However, it is interesting that students less preferred to “Searching from book and tangible materials (slide, lecture note, sheet)”. The result of expectation on the online media applied in gemology courses: case of the diamond grading (Fig. 4) clearly showed that the target students were agree to apply online media into the course which would be able to assist their learning in all aspect. Helpful for the in class activities and Make more understanding from what were taught are two highest scores. However, student were not yet assured that the online learning would motivate their interesting in diamond grading.

![Figure 3. Preferred tools for making decision on gems identification or diamond grading result.](image)
3.2 Problems analysis

From the questionnaire, we have analyzed the problems in the gemology class. There is no “most understanding teaching method” for target students, but they preferred to mix various teaching methods for the laboratory courses. However, certain may not be familiar to certain online methods or do not prefer to have extra work (research, assignment or quiz). In consequence, the Diamond grading course should be designed by mixing various teaching methods.

For the next problem, target students were less prefer to search from books or tangible materials. This may be a sign for future trend of study, even for a practice course. Hence, the Diamond grading course should provide online course materials for students. In addition, some students used tablet in the class that would give them chance to read or take immediate note in the online course materials.

However, certain of target students still need lecture course before starting lab class. This could deduce that students need to have contact with lecturer. A face-to-face teaching method still be necessary for basic knowledge and onsite practice. However, implementation of the online teaching methods would support students’ to reach the courses outcomes.

In addition, for the informal interviewing and noticing, students have had problems in making right decisions because they have compared their case with the unreliable sources or they could not make a proper judgment.

Therefore, the Diamond grading course has been designed to have face-to-face approaches by using problem based learning and onsite diamond grading practice. The problem cased have been designed that students might make a searching the website or other online media to be able to systematically present their learning outcomes. To augment the diamond grading competence, the online methods has been selected to fit with the requirements of target students. The criteria for the online elements were that students should easily access the online tools, they should not spend too much time in learning to get familiar with the tools and they should be able to encourage them to success in the course. Therefore, website, LINE application, Google classroom and Google form are used in this study.

3.3 Course and blended learning method designed

The Diamond grading course has been plan for 4 hours per day within 15 weeks or about 60 hours per semester. The principle contents of the Lab activities are comprised of separate diamond from its simulants by loupe, 4 Cs grading system: Carat, Color, Clarity, Cut, and Diamond’s price estimation.

The onsite plan has been designed for 60 hours, which composed of Lecture content for lab course, Lab activities and online activities (during the course). The 20 hours of the online learning (outside the classroom) have been assigned as the additional learning approach. In total, the students were expected to spend about 27 hours which is 37% of total learning hours, as shown in Table 1 and Fig.5.

The target students have been expected to make the best profit from both online activities (during the course) and online learning (outside classroom).

From the observation in the class, the target students have been assigned to solve the problems about the diamond properties and diamond formation. They have learnt about the basic knowledge of diamond by reading the case given and surfing the internet. However, they were not very well success in the conclusion presentation about the diamond properties and diamond formation. So the process has been repeated with other cases for the same topics. The conclusion presentation in class was
better established than the previous ones. Then the same process was also used for synthetic diamond, treated diamond and diamond’s simulants. The problem solving and website learning method helped the target students to improve their searching ability and be able to make deduction from the topic given in class. However, this was a personal responsibility and was uncontrollable.

Table 1. Proportion between onsite and online methods used in the Diamond grading course.

<table>
<thead>
<tr>
<th>Lecture content for lab course</th>
<th>Hrs</th>
<th>Lab activities</th>
<th>Hrs</th>
<th>Online activities (during the course)</th>
<th>Hrs</th>
<th>Online learning (outside classroom)</th>
<th>Expected Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Properties of diamond, Synthetic diamond and diamond's simulants</td>
<td>2</td>
<td>separate diamond from its simulants by loupe</td>
<td>1</td>
<td>website for problem based learning activities</td>
<td>3.5</td>
<td>website and google classroom</td>
<td>4</td>
</tr>
<tr>
<td>4 CsDiamond grading: Carat weight calculation, colorless and fancy color grading, clarity grading and round brilliant and fancy cut grading.</td>
<td>6.5</td>
<td>Carat measurement</td>
<td>0.5</td>
<td>google classroom</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Color grading practice (colorless diamond)</td>
<td>12</td>
<td>Website, VDO clip, LINE</td>
<td>1</td>
<td>VDO clip, LINE and google classroom</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clarity grading, inclusions type and inclusion plot</td>
<td>12</td>
<td>VDO clip, LINE</td>
<td>0.5</td>
<td>VDO clip, LINE and google classroom</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4 CsDiamond grading practice: Cut</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>How to calculate diamond's price</td>
<td>3</td>
<td>Website, VDO clip, LINE</td>
<td>1</td>
<td>VDO clip, LINE and google classroom</td>
<td>3</td>
</tr>
<tr>
<td>Total hours</td>
<td>12.5</td>
<td>40.5</td>
<td>7</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course period</td>
<td>60</td>
<td>Online hours</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 5. The Proportion of Diamond grading course.

LINE application, however, was a well-known chat application in the region. A group line for gemology course has created on the purpose of sharing course information and an online activity. From the observation during the practice class, the target students were enjoyed to take picture of diamond grading techniques, diamond brightness samples, inclusions types, then, to share in the group LINE. This could be helped students to make grading decision. However, the lecturer was stayed in class for the question and problem discussion. The problems found in using LINE application were the documents or pictures or VDO clip uploaded should be downloaded as soon as possible, if not they would be expired after a while. In addition, students casually enjoyed taking photos of diamond
samples but they had not yet habit of posting and sharing their experiences to each other. Therefore, the lecturer had to urge them from time to time.

The Google classroom has been aimed to provide all course materials and media (pictures, VDO clip, course slides, including course planning) for the target students would be able to learn at any time and any place. The materials could be downloaded and print out. For this study, the online quiz has been used not only to assess the understanding of the target students, but also to verify the attention of the target. However, some technical troubles have occurred during the experience. As the Google classroom has been attached to the university e-mail account system, by consequence if any student used the private e-mail account, which was not reported to the system, they would face the trouble to access the quiz or course materials. In addition, from the interviewing, some students reported the errors of the course material uploaded in PowerPoint form. For this reason, all PowerPoint files have been converted into PDF files. Furthermore, certain VDO clips could not be opened which might be the uploaded problem.

For the onsite approaches, the lecturer has concluded the knowledge content after the problem based learning activities. All the lab activities have been defined either as a skill practice activity or a problem based learning. The target students have learnt from the cases given, for example, grading the clarity of diamond. A diamond sample has been given to each group of students (4-5 students per group). Without being taught, the students had to search the website for the worldwide accepted clarity scale, then discussed for the clarity grade of the diamond sample. The complete clarity scale lecture would be given after that. The similar methodology has been implemented into all 4Cs grading systems. The result showed that students showed more confident in decision making and posted more questions about what they did not understand comparing to previous gemology courses. However, for certain students who were not yet habituated to the light reflection in diamond (especially, the tiny ones) and the more precisiated grading system, even by all techniques applied in the course, they still complained of difficulty and showed boredom in class.

3.4 Students’ opinion related to the blended learning method

The second questionnaire has been done at the end of the course. Same group of target students have shown their opinion about the blended learning method applied as following. The former expectation about the Diamond grading laboratory course of the target students has been revised. Fig.6 showed that at the beginning of the course 39% of students gave a neutral attitude to the course and 28% showed interest to learn.

![Figure 6. Expectation at the beginning about the Diamond grading laboratory course of the target students](image)

Comparing to the initial survey in the question about the most understanding and useful teaching methods and about the agreement of the online media applied in diamond grading laboratory course, the target students showed their opinion in the same direction. Fig.7 showed the survey results that every approaches have been voted among the range of “good for some topics – help for more understanding and most understanding and helpful method”. By consequence, we could deduce that students preferred to mixed several teaching methods, both onsite and online methods. However, the target students showed less preferable for learning by the searching website and by doing the online quiz. This may because of the overloaded of the information in the website or technical problem during the quiz. In Fig.8, the students agreed that media elements were helpful for all aspects and the
disagreement has been taken off. This should be a sign that after blending onsite and online approaches, students presented more comprehensive in the new teaching technique which have never been used in such a course in the program. However, only one person said that he/she did not agree that the online media would give chance to learn at home or anytime. This is very doubtful that the person may have had incident during the course which could be either technical problem or personal attitude.

![Figure 7. Opinion of the target students about the most understanding and useful teaching methods for diamond quality grading (at the end of the course)](image)

![Figure 8. Opinion of the target students for the online media applied in diamond grading laboratory course (at the end of the course)](image)

Fig. 9 showed that the target students preferred to spend 3-5 hours to learn from online media depend on the topic. However, 3 hours per topic is the most preferable time for online learning. The target students have weighted the most suitable online learning activities by using rubric scale (5 is most preferable to 1 less preferable and 0 for no need). The study found that VDO clip (youtube) and sharing images from class were, respectively, 2 most preferable online learning activities (Fig. 10). However, the variation of scores for these activities was insignificant among 3 first rubrics. It should notice that course materials were evaluated at scale 4 (preferable online instrument) and obviously the highest among all.

![Figure 9. Opinion of the target students for the online media applied in diamond grading laboratory course (at the end of the course)](image)
To compare 3 online media used in this course, students have scored the problems faced during learning from each online media (Fig.11) Students found that the most important problem was management of the information found by learning form website. The error in downloading or reading the course materials was often happened while learning from website. For the LINE application both problems were reported but at much lower score. The Google classroom, as a new instrument to the course, students have had problem in access the program. Therefore, error in downloading or reading the course materials was the frequent problem reported.
4 CONCLUSIONS

Initial survey of the target students showed that students trended to easily acquiesce the blending onsite and online teaching method for Diamond grading laboratory course. However, the presence of teacher in class is necessary to solve their problem in the class. The target students expected that the blending teaching method would motivate their interesting in the course. In addition, they expected that the online media would encourage them to achieve the course’s learning outcome.

Therefore, 3 online media have been applied into the course. First trial was blending problem based method and website searching. They have learnt how to deduce the information from websites to reach the learning outcome. However, the target students less preferred this learning method. LINE application, in another hand, students agreed that sharing experiences and information through LINE was suitable for learning. The problem existed with the application of the expiration of files uploaded. Moreover, it was not possible to manage the information posted in the LINE application because the application ran in timeline. Google scholar was first time used in the course; therefore, necessary time for enrollment and getting familiar with the program has been required. The course materials, VDO clips, sharing images, assignments and online quiz were activities in the program. The problems existed once the target students could not access to the online classroom’s room activities. The informal interview confirmed that they did not receive an authorization to login by using their private e-mail instead of the university’s e-mail address. This caused the delay for assignment or quiz.

The survey at the end of the course showed that blended learning method could motivate students to learn and achieve the course outcome. 3 hours would be a suitable period to assign students to learn online. The target students used online media mostly to share course VDO clip and sample case images. Most of students in class were agree that download and learn from course slide. But there were various opinions for the online quiz and online assignment. The problems in online learning method showed that the problems in using Google classroom were most various, comparing to the other 2 online media. Nonetheless, students could not be able yet to learn by searching websites.

In conclusion, for their generation, the target students well acquiesced for blending method. The online media could motivate students to learn and eager to post the questions. However, the target students also required the presence and advices of teacher in the class. In addition, they required to have all course materials in their mobile phone or tablet where they could find or read anytime or any place. Though, the survey showed that 3 hours should be suitable time to use online media for each topic, the responsibility and personal condition could be the important factors of success of blended learning method. Certain students lacked of eagerness in learning, neither onsite nor online. Therefore, the online quiz or face-to-face examination must be used to motivate students to study outside the classroom.

REFERENCES


