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Competency Appraisal as a Tool in Improving the Board Exam Performance of Benguet State University Bachelor of Science in Forestry Graduates

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Abstract

For the past years, Benguet State University has devised an appraisal course to improve its national passing average for the forestry board exam. This study evaluated the effects of course competency in preparing Bachelor of Science in Forestry students for their board exam. Pre-test and post-test of students who enrolled in the course were done to assess students' level of preparation and perception of the various mock exams given and determine the most important factors affecting their performance. Furthermore, a comparison between the actual board exam and mock exam performance was made. Results showed that students have average levels of preparation and marginal expectation in their exam scores. Study habits and subject difficulty are important factors in their preparations. Generally, the course competency was able to help them prepare for the actual board exam.

KEYWORDS

course competency
performance
computer-based mock exam
predictor
forestry licensure examination

Introduction

State universities offering Bachelor of Science in Forestry (BSF) are best measured by their graduates' performance in the national board exam. From 2010 to 2015, Benguet State University (BSU) forestry graduates barely surpassed the national passing average. Thus, BSU added a course competency in the BSF curriculum in 2015 to improve its licensure exam performance. In 2017, the idea of incorporating Computer-Based Exams (CBME) on top of regular written exams was introduced. After five years of implementation, there is a need to evaluate its effect on BSU's board exam performance, considering this course is an additional subject for the BSF.

Competency Appraisals 1 (FOR 143) and 2 (FOR 144) were originally one-unit laboratory courses given to 4th year BSF students. They were designed to prepare students for the rigorous requirement of the board exam. These courses gave a series of mock exams in the four main areas of competency: the Forest Ecosystem (FE), Forest Production Management (FPM), Forest Utilization and Engineering (FUE), and Social Forestry and Forest Governance (SFFG). A mock exam gauges students' weaknesses and strengths and allows them to know their overall standing. It is essential in preparing students for national exams (Harshitha, 2017). Mock exams encourages students' preparedness for board exams by helping students experience question structures and

improve retention of essential concepts.

This study aims to assess the effectiveness of the competency appraisal courses in addressing the need to improve BSU's forestry board exam performance. It surveys the students on their perspective on the level of preparations, performance in mock exams, factors that affect academic performance, and determine the subjects where they needed additional interventions. The study also profiled the board exam performance of BSF graduates and correlated them with the mock exam performance that will be helpful to both the students and faculty reflections. Results can serve as a basis in coming up with improvements in course competency mock board exam and other action plans grounded on this research. Garton et al. (1999) mentioned what has been lacking in most studies on education is a research that focuses on the knowledge learned in that course and the factors that influence students' achievement, which this study hopes to bridge.

Conceptual Framework

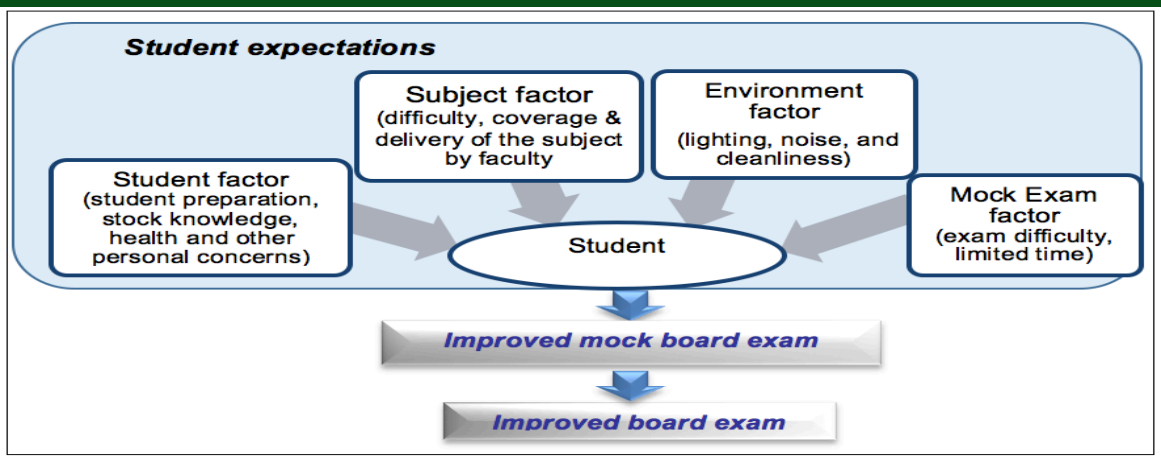
The research is based on Heider's Attribution Theory as refined by Orvis Cummingham and Kelly (1975) and Deci (1975) as cited by Miñoza (2016). The theory describes individuals as logical, who ask questions concerning events and circumstances, and like a scientist, investigates the causal factors that answer the why's. The causal factors can either be internal (characteristic or disposition of a person) or external (such as environmental factors). As individuals investigate their social domains logically and systematically, they can interpret life's events, which is an affirmation that they can understand and identify significant life events (Mateo, 1998 as cited by Miñoza, 2016), such as preparation for board exams.

In this study, the internal factor was the student factor, and the external were the mock test, subject, and environmental factors (Figure 1). The mock board exam performance is mostly dependent on students, subject, mock test, and environment factors (Miñoza, 2016; Quiambao et al., 2015; Racadio et al., 2014; Rasul & Bukhsh, 2011). All these factors influence the overall student performance during the mock and actual board exam. If improvement in the board exam is targeted, these factors must be evaluated to maximize course competency benefits.

The study primarily assumes that the respondents can evaluate the different factors that affect their performance in exams. It also hypothesized that most students have at least an average preparation concerning their mock exams; they expect to pass their mock exams; those mock exams have at least an average level of difficulty; they can evaluate the factors that affect their exam performance; and that the overall class performance of students in course competency mock exams determines their overall board exam performance.

Figure 1

Conceptual Framework of the Study



Methodology

Research Design

This study used survey design with pre-tested questionnaires and data mining. Survey questionnaires were administered to all 4th year BSF students who took course competency appraisals (FOR 143 and FOR 144) in 2017 and 2018. Prior to taking any written mock exam, a pre-test questionnaire was administered, and after each exam area, a post-test questionnaire was also administered to them. The Likert scale 7-1, 7 being the highest and 1 the lowest, was used to differentiate and interpret students' perception on their level of preparations, exam difficulty, and the factors affecting their performance in the exam.

Exam Preparation

Weight	Range	Interpretation
7	6.50 - 7.00	Excellent
6	5.50 - 6.49	Above average
5	4.50 - 5.49	Average
4	3.30 - 4.49	Below average
3	2.50 - 3.49	Poor
2	1.50 - 2.49	Very poor
1	1.00 - 1.49	Negligible

Exam Difficulty

Weight	Range	Interpretation
7	6.50 - 7.00	Very easy
6	5.50 - 6.49	Easy
5	4.50 - 5.49	Average
4	3.50 - 4.49	Fair
3	2.50 - 3.49	Tricky but ok
2	1.50 - 2.49	Difficult
1	1.00 - 1.49	Very difficult

Factors Affecting Student Performance

Weight	Range	Interpretation
7	6.50 - 7.00	Excellent
6	5.50 - 6.49	Very good
5	4.50 - 5.49	Good
4	3.30 - 4.49	Moderate
3	2.50 - 3.49	Acceptable
2	1.50 - 2.49	Poor
1	1.00 - 1.49	Very poor

Considering the study made by Racadio et al. (2014) where particular subjects may reflect students' board exam performance, the ranking of subjects in terms of difficulty was also assessed. Students ranked the top five subjects they considered the most difficult and subjects they had the least preparations.

There were two types of mock exams used in this study, the written and the computer-based mock exam (CBME). The written exam was a one to two-hour written exam per area, consisting of a 100-point multiple-choice test format. All students in four sets simultaneously took up these exams. Only up to three removal exams were given to students to improve their class standing in case of failure. Answers to the exam questions were discussed in class, and copies of corrected exams were returned to students. The CBME, on the other hand, was designed by the researcher as an MS Excel-based 100-points multiple-choice test format that was given to students for an hour. There were multiple schedules fixed per week for this type of exam in which a batch of students, usually 15 at a time, took the exam. They could retake the same exam as often as necessary in order to pass. The passing rate for CBME is 75%. There were also four sets designed per area in CBME to avoid side glancing. Digital copies of the CBME were not returned; instead, review materials were made accessible where questions were taken at random and included in the CBME. The questions per area remained the same, except in forest utilization and engineering (FUE), where the exam was replaced in 2018.

The study also made use of existing data of board exam takers and their results. Only those who enrolled in the semester of concern in the course competency and who graduated and took the board exam for the first time were considered in the logistic regression. Student records on the mock exam scores and the number of times they took the exam in the CBME before attaining a 75% score were used for logistic regression in this study.

Data Analysis

Survey results were tallied and analyzed using descriptive statistics. Data analysis was done with the aid of Stata 14.2 for Windows and Excel. The t-test, z-test, Kendall non-parametric correlation, logistic regression, and other omnibus tests in the analysis of responses and exam scores were used.

The t-test was applied to compare students' mean responses for similar questions in the pre and post-test, while one population, one-tail z-test was used to evaluate responses to questions that can help indicate the level of confidence in particular responses. The z-test assessed the perceived factors that influence students' performance in written mock exams.

Weighted mean and rank were utilized to characterize and interpret the factors that affect the mock exam performance. Only the top five identified factors were presented in the results. In the ranking of the subjects covered by the area, students were asked to identify their top five most difficult and least prepared subjects. Since not all subjects were ranked by each student, a 50-50 weight scale was adopted. Fifty percent was based on the mean rank given by all students, and the other 50% was based on the number of students who ranked them to be part of their top five. This was also used to rank the factors that affect student performance in the written mock exam as provided in the post-test.

A binary logistic regression model where $p|x=\beta_0+\beta_1 x_1+\cdots+\beta_p x_p$ was used to address the last objective. It used the dichotomous outcome of failing and passing the board exam, where the response was coded with appropriate values of 0 and 1, respectively. On the test on underlying relationships between mock and actual board exam performance, Kendall non-parametric was used, while on model adequacy, Chi-square test results, maximum likelihood, odds ratio and R squares were generated (Miñoza, 2016).

Logistic regression is based on the function $P(1) = (1/1+e^{-(\varphi 0 + \varphi 1x1 + \varphi 2x2)})$ since it computes the odds ratios that indicate the likelihood of occurrence by non-occurrence in each factor (Burns & Grove, 2005 as cited by Fortier, 2010 & Minoza, 2016) to determine the probability of an outcome occurring (the passing and failing in board exam). The average scores for the mock exam per area for the written mock exam and CBME and the number of times they took CBME before they passed were used separately as independent variables in determining the probability of passing the board exam. The result was a predictive value that gives the probability of passing the board exam based on the mock exam performances.

Results and Discussion

Level of Preparation of Students in the Written Mock Exam

The level of preparations of most students for written mock exams were at least average ($p<0.00001$), except for the FPM pre-test and the FE and SFFG post-test that were below average ($p<0.0522$). Thus, students who studied before taking the written exam were confident in their preparation level (Table 1). However, a highly significant difference in the pre- and post-test perceived level of preparations for FPM and SFFG. Students underestimated their performance in FPM ($p<0.00001$), that is, from below average after taking the exam; they perceived they have average levels of preparation. Contrary to the perceived preparation in SFFG, students thought they have average preparation but later changed their minds to below average ($p<0.00001$). This results indicates a rational evaluation of performance among student participants of the study.

Students' Perception of Expected Score

Most students expected to pass their mock exams only by a margin (Table 2). Their expected scores were mostly from 61-74%, except in the pre-test in SFFG and post-test on FPM where they expected 75-90% scores. However, in the post-test of SFFG they expected a low score of 41-60, probably due to the exams' difficulty.

The average passing for most forestry subjects in BSU is 60%, which contradicts the passing mark required in the board exam, which is 75%. Thus, it will require additional effort on examinees to prepare for the forestry board exam.

The significant differences between pre-and post-test expectation of scores indicate a change of mind after taking the exam. These show logic and sensibility in the way respondents assessed their preparation, performance and exam scores, which is consistent with the Heider's theory as mentioned by Mateo, 1998, as cited by Minoza, 2016.

Difficulty of the Mock Exam

Based on the results (Table 3), most students expected the degree of the written mock exams

Table 1

Students Level of Preparations for Mock Board Exam

Major Areas	N	Mean	Description	Standard Error	Standard Deviation	z value	Significance Level (1-tailed) Pr(Z > z)
Forest Ecosystem							
Pre-test	85	4.82	average	0.0680	0.6267	11.9426	<0.00001
Post-test	85	4.18	below average	0.1087	1.0021	1.6236	0.0522
Forest Production and Management							
Pre-test	75	4.36	below average	0.0862	0.0769	4.1743	<0.00001
Post-test	75	4.89	average	0.0882	0.7636	10.1318	<0.00001
Forest Utilization and Engineering							
Pre-test	85	4.60	average	0.0752	0.6935	7.9765	<0.00001
Post-test	85	4.53	average	0.0998	0.9205	5.3024	<0.00001
Social Forestry and Forest Governance							
Pre-test	91	4.70	average	0.0804	0.7673	8.7435	<0.00001
Post-test	91	4.45	below average	0.0754	0.7190	5.9776	<0.00001

Ho: Mean = 0 Ha: Mean ≥ Average

Table 2

Scores that Students Expect to Receive from Their Mock Exams

Major Areas	N	Mean	Description	Standard Error	Standard Deviation	z value	Significance Level (1-tailed) Pr(Z > z)
Forest Ecosystem							
Pre-test	83	5.48	61-74%	0.0913	0.8317	5.2790	<0.00001
Post-test	83	5.19	61-74%	0.0898	0.8184	2.1460	0.0159
Forest Production and Management							
Pre-test	75	4.97	61-74%	0.1056	0.9149	-0.2524	0.5996
Post-test	75	5.68	75-90%	0.0971	0.8408	7.0036	<0.00001
Forest Utilization and Engineering							
Pre-test	86	5.16	61-74%	0.0904	0.8382	1.8010	0.0358
Post-test	86	5.16	61-74%	0.1083	1.004	1.5033	0.0664
Social Forestry and Forest Governance							
Pre-test	91	5.55	75-90%	0.0785	0.7493	6.9953	<0.00001
Post-test	91	4.34	41-60%	0.0800	0.7633	-8.2399	1.0000

Ho: Mean = 0 Ha: Mean ≥ 75%

to be at least tricky for all areas ($p<0.00001$) except in the pre-test for the forest ecosystem, the first of all mock exams, where there were mixed expectations ($p=0.0795$). Since this was the first mock exam, students were confident that they had studied well; they had stock knowledge, had reviewed the courses they already took up, and there were sufficient reference materials (71%), thus were hopeful that they would do well in the FE mock exam. On the other hand, some doubted their study habits and preparations, lacked review materials, missed much of the classes, and had limited time to review that they expected the exam to be difficult (26%). The rest were uncertain of their performance, which, if evaluated, would depend on whether what they have studied will come up or not. These were also the students who could not cover well or review enough the subject, had doubts about their capability or had no idea about the extent of preparations required of the mock exam. It is not until after the FE exam that many respondents (34%) realized the need to improve their preparations for future examinations.

In the posttest, students were able to identify subjects of weakness, like those they had not taken or those with the least discussions in classes. Students also realized they had limited time to answer the exam and that computing skills are needed. Some also understood that the covered subjects were difficult or had comprehensive coverage. Pairwise mean comparison using the t-test for responses from both pre and post-test showed a highly significant difference ($p<0.00001$), and indicate that most student (57%) found the first mock exam on forest ecosystem tricky to very difficult after the exam administration, compared to what they had expected.

After the FE exam, students' higher level of difficulty was expected by students, especially for FPM. Students expected that the exam would be tricky to very difficult for SFFG (54%), FUE (68%), and FPM (72%). After the post-test, the number of students who found the exam as tricky to difficult were reduced, indicating good student preparation. However, in SFFG, those that expected a tricky exam expressed that a more difficult exam was administered.

Table 3

Difficulty of the Written Mock Exam as Assessed by Students

Major Areas	N	Mean	Description	Standard Error	Standard Deviation	z value	Significance Level (1-tailed) Pr(Z > z)
Forest Ecosystem							
Pre-test	83	3.83	fair	0.1198	1.0912	-1.4083	0.0795
Post-test	83	3.34	tricky but ok	0.1601	1.4590	-4.1378	<0.00001
Forest Production and Management							
Pre-test	76	2.66	tricky but ok	0.1178	1.0270	-11.3926	<0.00001
Post-test	76	3.45	tricky but ok	0.1343	1.1706	-4.1153	<0.00001
Forest Utilization & Engineering							
Pre-test	81	3.05	tricky but ok	0.1229	1.1057	-7.7378	<0.00001
Post-test	81	3.09	tricky but ok	0.1114	1.0025	-8.2020	<0.00001
Social Forestry & Forest Governance							
Pre-test	91	3.45	tricky but ok	0.0630	0.6012	-8.2489	<0.00001
Post-test	91	3.14	tricky but ok	0.1089	1.0389	-7.8703	<0.00001

Ho: Mean = 0 Ha: Mean is at least average in difficulty

Students' foremost reasons for assessing exam difficulty were based on confidence in study habits, exam preparation, stock knowledge, review of previous examinations, understanding of extent of the requirement of a mock exam, readings, and new knowledge gained. In contrast, students who perceived the exam would be difficult were students who did not study well, had difficulty studying especially for problem-solving in FUE, gauged the subject area as difficult or perceived the broader coverage of the exam, had insufficient knowledge of the subject, and were less familiar with some forestry concepts. Other students expressed the need for more discussions in classes as the exam included some subjects that were not yet taken or needed more time for computations and thus expected the exam to be difficult and very difficult. The rest of the students were uncertain and had no idea how they would fare in the mock board exam and opted not to give their ratings on the exam's difficulty.

In the case of FUE, the pairwise mean comparison reveals similar perceptions of students in the level of difficulty of the FUE mock exam during the pre-and post-test (p=0.442). Students' expectation of a more difficult FUE mock exam motivated them to improve their study habits.

For SFFG, there is a highly significant difference in the level of difficulty for pre and post-test. SFFG covers mostly memorization of laws but requires sharpness owing to the need to analyze each question more seriously. Again many found the exam tricky to very difficult after taking the exam (p<0.00001).

As observed, students based their assessment of the difficulty of the exam on their levels of preparations, assuming sufficiency, but after the exam, they could evaluate whether these were sufficient or not. This result is consistent with the findings of Mateo, 1998 as cited by Minoza, 2016, where individuals could logically interpret for themselves what happened during a particular event, in this case, their exam. Thus, many recognized the need to improve their preparations, computational skills, recall of formulas, and secure more review materials as they were exposed to several mock exams. Often, less than 10% of the respondents were confident they passed their mock exams or mentioned that the exam is easy. Thus, there is a need to expose them to more mock exams to familiarize them with exam structures and the board exam's likely difficulty.

Further, students express concern about the need for updates in FUE, the wide subject coverage of FPM, and the required analysis in SFFG. These were identified as areas where students have difficulty. Also, statement analysis like three to four statements True or False, a dominant type of questioning in SFFG in the recent years' board exam, made the exam difficult. The problem-solving nature of FPM and FUE was also more challenging to some students, especially those who had difficulty in calculations under time pressure.

Factors that may Affect Students' Performance in the Mock Exam

Based on the survey, students perceived the environmental condition such as lighting and neatness and the students' physical and mental preparations as good to moderate when they took the mock exams (Table 4). Their subject preparation was also moderate, and the noise level was moderate to acceptable before taking their exams. Only the noise concern during the exam was identified as likely to affect the written mock exam results, yet it was still assessed as acceptable.

After the examinations, students were consistent in their ranking of factors that affected their performance. The topmost factor in their exam performance as they perceived was their exam preparation; this was followed by the difficulty of the subjects included in each area exam, coverage, difficulty and trickiness of the exam, and the stock knowledge they gained. It was only in the forest ecosystem that the faculty's delivery was considered a factor in the mock exam performance (Table 5). Thus, environmental factors, the time limit for the examination, health, and other personal concerns of the students are of the least concern among the mock exam takers. The result conforms with the study of Rasul and Bukhsh (2011); Racadio et al. (2014); Quiambao et al. (2015); and Miñoza (2016), and contrast with the study of Church (2001) that identifies environmental factor as a significant factor in influencing exam results.

Results indicate that the foremost factors that students considered affecting their exam performances were the student and subject-based factors. Therefore, encouraging students to improve study habits, quality class instructions, and improved subjects' delivery are needed.

Table 4

Factors that may Affect Students' Performance in the Written Mock Exams

Major Areas	N	Mean	Description	Standard Error	Standard Deviation	z value	Significance Level (1-tailed) Pr(Z > z)
For FE Exam							
Environment							
Lighting	81	4.53	good	0.1280	1.1520	11.9596	<0.00001
Noise	79	4.27	moderate	0.1205	1.0707	10.5080	<0.00001
Neatness	81	4.72	good	0.1155	1.0396	14.8555	<0.00001
Physical preparation	81	4.70	good	0.1184	1.0659	14.3855	<0.00001
Mental preparation	81	4.62	good	0.1105	0.9946	14.6348	<0.00001
For FPM Exam							
Environment							
Lighting	78	3.71	moderate	0.1239	1.0944	5.6905	<0.00001
Noise	78	3.46	acceptable	0.1178	1.0406	3.9170	<0.00001
Neatness	78	3.99	moderate	0.1284	1.1338	7.6895	<0.00001
Physical preparation	78	4.19	moderate	0.1278	1.1288	9.3285	<0.00001
Mental preparation	78	4.05	moderate	0.1289	1.1384	8.1556	<0.00001
Subject Preparation	78	3.63	moderate	0.1294	1.1294	4.9125	<0.00001
For FUE Exam							
Environment							
Lighting	88	4.16	moderate	0.1251	1.1733	9.2670	<0.00001
Noise	89	3.45	acceptable	0.1298	1.2248	3.4616	<0.00001
Neatness	80	4.09	moderate	0.1169	1.0457	9.3017	<0.00001
Physical preparation	83	4.71	good	0.1254	1.1426	13.6409	<0.00001
Mental preparation	85	4.41	moderate	0.1049	0.9673	13.4565	<0.00001
Subject preparation	77	4.21	moderate	0.1051	0.9225	11.4888	<0.00001
For SFFG Exam							
Environment							
Lighting	88	4.11	moderate	0.1494	1.4014	7.4545	<0.00001
Noise	92	3.82	moderate	0.1236	1.1853	6.5966	<0.00001
Neatness	90	4.04	moderate	0.1312	1.2444	7.9624	<0.00001
Physical preparation	87	4.77	good	0.1220	1.1381	14.5065	<0.00001
Mental preparation	71	4.54	good	0.1526	1.2854	10.0635	<0.00001
Subject preparation	91	4.29	moderate	0.1086	1.0359	11.8403	<0.00001

Ho: Mean = 0 Ha: Mean > Acceptable

Moreover, the quality of the mock exam must be improved and updated. Monitoring and evaluation of students' performance must also be done regularly.

Subjects that were Perceived by Students as Difficult and Needing Interventions

Exam takers also ranked the subject covered by their examination. The top five subjects that were considered the most difficult and subjects they are least prepared are presented below for future intervention (Table 6). The most difficult subjects identified were Dendrology, Forest Biometry, Forest Policy, Governance and Laws, and Wood Physics and Mechanics.

Similarly, those identified as the most difficult subjects were also the subjects where students were least prepared. However, elective courses like

Table 5

Top Factors that Affected Students' Performance in the Written Mock Exams

Factor	Number of students that rank the factor (A)	Average rank of the factor (B)	Rank based on A and B (A+B)/2	Weighted rank of the factor
For FE Exam				
Student Preparation	83	2.46	1.73	1
Difficulty of the subjects	82	2.60	1.80	2
Coverage	80	3.30	2.17	3
Delivery of the subject	80	4.86	2.95	5
Exam factor (difficulty/trickiness)	82	4.54	2.77	4
For FPM Exam				
Student Preparation	66	2.36	1.70	1
Difficulty of the subjects	69	3.77	2.38	2
Coverage	65	3.89	2.48	3
Exam factor (difficulty/trickiness)	66	5.08	3.06	5
Stock knowledge	65	4.77	2.92	4
For FUE Exam				
Student Preparation	76	2.18	1.59	1
Difficulty of the subjects	70	2.57	1.83	2
Coverage	71	3.17	2.12	3
Exam factor (difficulty/trickiness)	53	4.02	2.73	4
Stock knowledge	54	4.07	2.74	5
For SFFG Exam				
Student Preparation	82	2.134	1.567	1
Difficulty of the subjects	79	2.684	1.861	2
Coverage	73	2.945	2.034	3
Exam factor (difficulty/trickiness)	57	3.386	2.412	5
Stock knowledge	59	3.288	2.339	4

Multiple-use Forestry, Aerial Photo Interpretation and Wood Chemistry, most students did not take up, were included in the subjects they were least prepared.

Many students understood that difficult subjects would require more time for review and readings due to unfamiliar terms and concepts, wider scope, and need for updates on the field. However, some attributed the difficulty to the limited discussions given by the faculty in their classes, especially in FUE. The problem-solving nature of FPM and FUE were also more challenging to some students, especially those who had difficulty in calculations under time pressure. Delivery of these subjects needs to be improved.

BSF Students Performance in the Mock Exams

Based on the written mock exam performance of students who served as respondents for the questionnaire survey, most of the examinees overestimated their mock exams' expected scores. Students' scores in the written mock exam were mostly in the range of 41-60% compared to the perceived expected score of 61-90% (Figure 2). Since it took time before written exams were returned to students, it delayed an important feedback mechanism for student preparation for succeeding exams, which is advantageous for the CBME.

Figure 2 also indicates that students' preparations for their mock exams were still

Table 6

BSF Students' Rank Evaluation of Subjects that were Considered as Difficult

Difficult Subjects*	Number of students that rank the subject as difficult (A)		Average rank of subject in terms of difficulty (B)		Rank based on A and B (A+B)/2		Weighted rank of the subject	
Test type:	Pre	Post	Pre	Post	Pre	Post	Pre	Post
FE Subjects								
Dendrology	44	56	2.66	2.29	2.33	1.64	1	1
Forest Ecology	29	28	3.28	3.14	3.16	2.57	5	5
Forest Soils	33	45	2.48	2.49	2.58	1.87	2	2
Forest Biodiversity	33	29	2.70	3.07	2.68	2.50	3	4
Tree Physiology	27	38	3.00	2.82	3.13	2.14	4	3
FPM Subjects								
Forest Biometry	62	66	2.18	2.29	1.59	1.66	1	1
Forest Economics & Finance	47	56	2.64	3.50	1.98	2.36	2	2
Multiple use Forestry***	10	61	4.40	4.74	5.30	2.93	9	5
Range Management	35	63	3.17	4.29	2.47	2.68	5	4
Silvicultural method	46	68	2.85	3.91	2.10	2.46	3	3
Aerial Photo**	29	-	2.52	-	2.33	-	4	-
FUE Subjects								
Wood Chemistry**	62	1	2.05	1.00	1.52	3.40	1	6
Wood Identification	52	66	1.87	2.94	1.53	1.98	2	3
Forest Product Utilization	51	65	2.53	3.42	1.87	2.22	4	4
Non Timber Forest Produt Utilization	12	63	3.33	4.19	4.25	2.63	5	5
Wood Physics and Mechanics	56	67	2.09	1.67	1.60	1.34	3	1
Wood Seasoning and Preservation	5	64	3.40	2.67	7.90	1.86	6	2
SFFG Subjects								
Forest Policy, Governance and Laws	87	73	1.70	1.78	1.10	1.39	1	1
Forestry Extension	77	69	3.91	4.06	2.24	2.56	4	4
Forest History and Administration	81	64	3.35	3.35	1.94	2.16	3	2
Professional Ethics and Values	70	64	4.37	4.37	2.50	2.77	5	5
Social Forestry	83	72	3.29	3.36	1.91	2.19	2	3

*Note: *Complete summary list is available in Appendix B; **Aerial Photo and Wood chemistry are not part of the course syllabi prescribed by the Board of Foresters. Some of the listed subjects of WST and SFFG were also fused.*

inadequate. Inculcating improved study habits in forestry subjects, readings on research and field updates, and boosting course appreciation that focus on forestry field practical applications can help. Likewise, teaching strategies that can motivate guided learning yet promote self-reliance are needed to preprare students for board exams.

A summary of statistics in Table 7 shows that students performed best FE, where the mean score is 61%. This area requires typically recall in the mock exam. In contrast, exam performance in FUE and FPM were almost even, having a mean score of 51 and 52%, respectively. Although the FUE exam scores were more widely distributed than FPM, both areas required problem analysis, making these two areas' mock exams difficult. For SFFG, which requires recall and statement analysis, there was a poor class performance, where the average score was only 47%. In this case, a system for immediate

Figure 2

Actual and Expected Scores of BSF Students in the Written Mock Exams

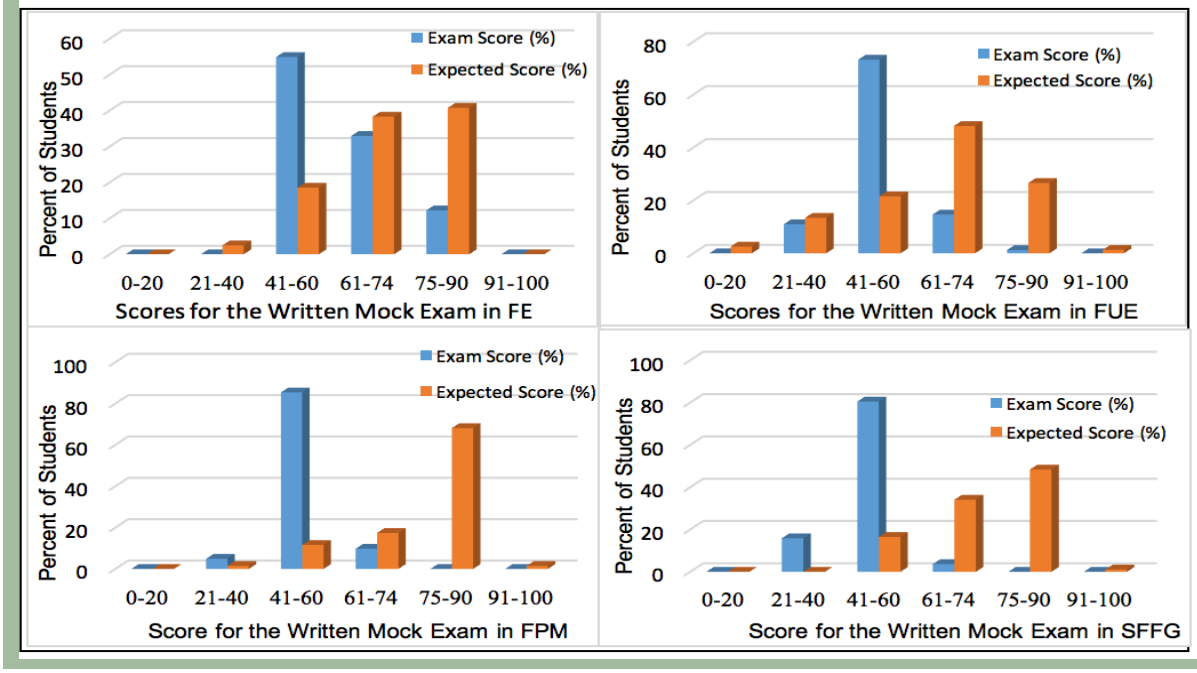


Table 7

Summary Statistics on Scores Obtained by Students in the Written Mock Exams

Major Areas	N	Mean	Standard Deviation	Min	Max
Forest Ecosystem	70	61.30	10.5437	42	86
Forest Production and Management	70	51.81	6.8149	36	68
Forest Utilization & Engineering	70	50.67	9.5519	24	78
Social Forestry and Forest Governance	70	46.60	6.5218	34	69
Average Performance	70	52.43	6.1091	41	71

feedback on students' performance (Harshitha, 2017) is very important for competency courses. If suppose the student can still recall his/her performance, preparations, and possibly questions that tend to confuse him/her, along with the exam result.In that case, it is more likely that he/she will remember the mistakes made, whether in recall or analysis, assess the extent of preparations that must be exerted, and thus invoke a positive response to students.

Given the average class performance for the four areas, more rigorous studying is needed by students to pass the written type of mock exam as offered in FOR 143 and 144. Further, a 60% score is considered a passing score by the course facilitator in this exam type. The instructor's overall average in this type of exam is lower than CBME, considering that even if they were allowed to remove the exam, a new set of removal exams is given. In contrast to CBME, the same exam question is given, even in the removal exam. This makes the written exam more difficult, but such exposure to more questions and greater exam coverage can also improve their preparations for the real board exam, which is more difficult and even wider in scope than most students usually expect.

As compared to the written mock exam, better CBME exam results were obtained by the same sets of students (Table 8). They obtained higher averages in the CBME. Students' scores for all CBME exams they took until they obtained a passing mark ranged from 31% to 86%. The most number of repeated exams was taken 13 times in the FE exam (Table 9). For most areas, students repeated the CBME two to five times before they obtained a passing mark of 75%; this emphasizes the importance of iteration in recall. Scores were also more distributed in CBME. Further, the immediate feedback in CBME facilitated checking and allowed students to prepare better as repetition allows better retention. However, the disadvantage of this exam type is the tendency of some students to depend on the many chances of being given and ignore rigorous studying.

For all four areas, 55% to 89% of examinees had CBME scores that fell below 75%. Majority of the scores cluster at 60-74%, which indicates the passing score given in almost all subjects in major courses in forestry, which is 60%. This is in conflict with the required passing of 75% in the forestry board exam and needs review. Also, even if the average performance for CBME is better than a written mock exam, the number of times the students retake the same exam tells us of ill preparations of some students before taking CBME.

BSU-CF Performance in the Actual Board Exam

Since 2016, BSU has produced more than a hundred board examinees for forestry. Historically, it ranked 3rd among schools that produce the most number of forestry passers (Parao, 2010; Professional Regulation Commission [PRC] (2010-2019). The marked increase in the number of students accepted in the BSF course in BSU, for instance, compared to its contemporary state universities and colleges like CMU, VSU, and NVSU, has a likely dilution effect on quality education. As students increased, board exam takers also continually increase, but education quality must have been reduced given our fixed educational resources. Those who failed also accumulate over the years, and continually risk BSU's overall standing, especially if board exam repeaters who take the exam yearly are not addressed.

Figures 3 and 4 show a comparison between the first-time takers performance and repeaters

Table 8

Summary Statistics on Scores Obtained by Students in the CBME

Major Areas	N	Mean	Standard Deviation	Min	Max
Forest Ecosystem	70	68.26	6.1625	55	81
Forest Production and Management	70	69.31	6.7146	53	85
Forest Utilization and Engineering	70	66.15	7.2173	47	85
Social Forestry and Forest Governance	70	73.07	5.0200	61	81
Average Performance	70	69.20	4.1646	60	78

Table 9

Summary Statistics on the Number of CBME Takes Before They Passed the Exam

Major Areas	N	Mean	Standard Deviation	Min	Max
Forest Ecosystem	70	3	1.5507	1	13
Forest Production and Management	70	3	1.6754	1	9
Forest Utilization and Engineering	70	2	1.1420	1	6
Social Forestry and Forest Governance	70	4	1.8931	1	8

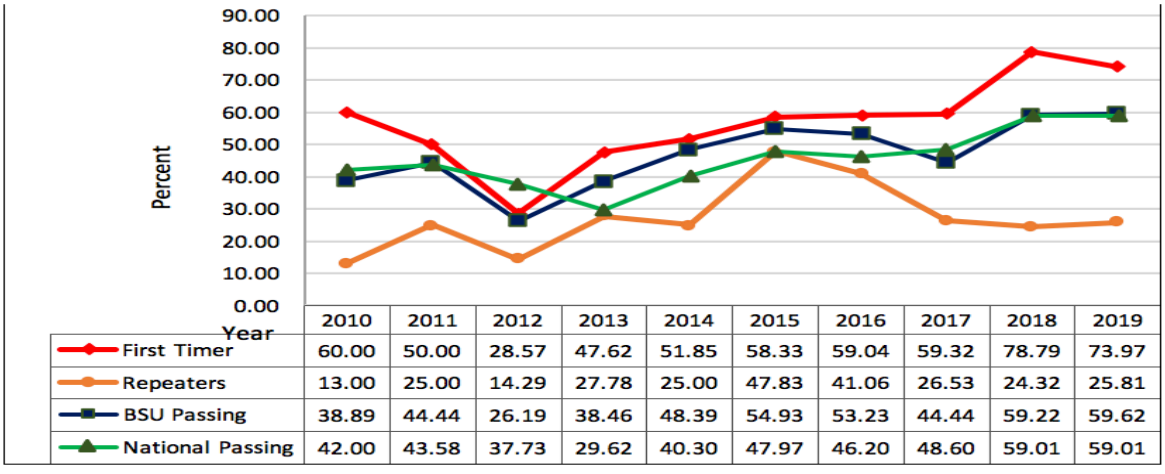
in the actual board exam in percent and the number of passers, respectively. It can be noted that there is marked improvement in the performance of fresh graduates since 2017 after offering course competency. This result is consistent with the study of Herbosa et al. (2017) that states that students' academic performance may not necessarily indicate the board exam performance. It may also take time before fresh graduate passers can pull up BSU's average rating. This is as long as updates and quality mock exams are ensured.

Figure 4 shows that fresh graduates always have better chances of passing the board exam; thus, fresh graduates must be encouraged to immediately take the board exam, although study preparations must also go with this. Instances in 2010, 2012, and 2017 where repeaters failing the exam pulled down the performance of BSU forestry graduates (Figure 3) must be considered in crafting intervention for board examinees.

At present, part of the BSU intervention included requiring CBME among old graduates

Figure 3

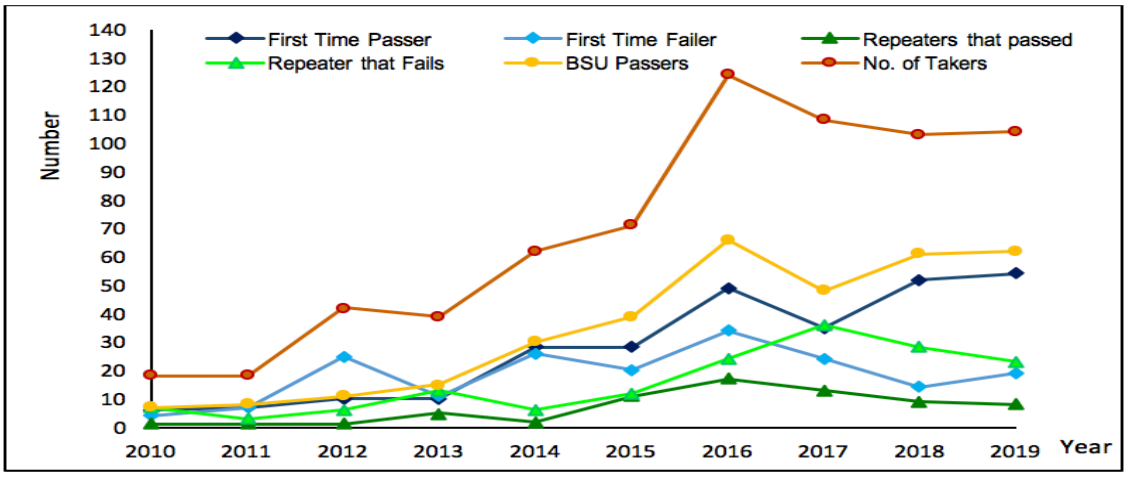
Percentage Passers for First-time Takers and Repeaters among BSF Graduates of BSU



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
First Timer	60.00	50.00	28.57	47.62	51.85	58.33	59.04	59.32	78.79	73.97
Repeaters	13.00	25.00	14.29	27.78	25.00	47.83	41.06	26.53	24.32	25.81
BSU Passing	38.89	44.44	26.19	38.46	48.39	54.93	53.23	44.44	59.22	59.62
National Passing	42.00	43.58	37.73	29.62	40.30	47.97	46.20	48.60	59.01	59.01

Figure 4

Number of Board for Forestry Takers and Passers among Graduates of BSU



before releasing the Certificate of Good Moral Character and providing free weekend reviews for the old graduates and repeaters a month before the board exam. Historically, the accumulation of board exam repeaters pulls down BSU forestry graduates' performance in the yearly board exams. However, as fresh graduates' performance is continually improved, there is the hope of pulling up BSU board exam performance in the future.

Relationship Between Mock Exam Results and Board Exam Performance of Students

There were significant direct correlations between the written mock exams for FE and FPM, and the students' overall passing in the forestry board exam in 2018 (Table 10). Likewise, the CBME for FE, FPM, and SFFG directly influenced the likelihood that students will pass the forestry board exam in the same year. On the other hand, there was a negative effect of the number of retakes in the computer-based exams for FE with passing the forestry board exam. It can be concluded that both the written and the computer-based exam scores for these particular areas were still reflective of their board exam performance. It likely gave students important feedback that they should have considered in their preparations later as board examinees. However, BSU must improve the scope and extent of the review made in the FUE area, which likely fails to capture the scope and difficulty in the actual board exam. It can be noted that many students passed the CBME for FUE even during their first take, and the highest score obtained was also in this area (Table 9), but the result of the analysis showed otherwise (Table 10).

Likewise, results of binary logistic regressions made on exam results show that mock exams likely benefited the students in their preparations for the board exams (Tables 11 and 12). The odds ratio also supports the rank correlation test. Except for FUE, all three areas exceed 1, which shows that a particular event will likely occur for FE, FPM, and SFFG. Thus, as students pass these area exams, they will likely pass these areas in the board exam. Likewise, in this study, the probability of SFFG computer-based exam can predict that the board exam's passing is more likely (p=0.04).

The regression coefficient that can be fitted in the model is given in Tables 11 and 12. The estimated logit: is $p|x$ = -10.0638 + 0.1649FPM score for written exam and for CBME $p|x$ = -23.39 + 0.1241 SFFG score - 0.9712 number of FE retakes. The written mock exam and CBME contributed a small positive contribution to student performance to the actual board exam. Thus, there is a need to continue this effort and further improve exam questions included in the mock exams. On the other hand, the pseudo R2 in this study of 0.21 (written mock exam) and 0.40 (CBME) indicates that CBME can reflect better students' performance in the board exam.

The fitted model in Table 11 indicated that the odds or likelihood of takers to pass the board exam and the written mock exam when FPM scores are zero is *exp(0.1649)=1.17*. This odds ratio is very low, and in fact, none of the examinees got a score of zero because the data set was standardized around a mean value. Hence, for a unit increase in the scores, about 18% increase

Table 10

Kendall Non-parametric Rank Correlation Between the Board Exam Result and the Mock Exam in 2018

Major Areas	Scores obtained in the Written Exam	Scores obtained in the CBME	Number of times the students retakes the CBME to pass
Forest Ecosystem	0.1880*	0.3110*	-0.2406*
Forest Production and Management	0.2981*	0.1673*	-0.0145
Forest Utilization and Engineering	0.0919	0.0667	-0.0807
Social Forestry and Forest Governance	0.0219	0.2480*	-0.0294
Average Performance	0.2232*	0.3346*	-0.1317

** significant at 0.05, (N =70)*

in the odds of passing the board exam can be expected. In general, the model suggests that for a fixed FPM score, the conditional logit of passing the board exam and written mock exam is $\log(p/(1-p))(\text{FPM score}=x) = <0.0001 + 0.1649 * \text{FPM score} + \varepsilon_{ij}$. Recall also that a pseudo R squared value closer to zero indicates that the model is much better than an intercept-only model. The reported pseudo R-squared of 0.21 supports that the model with FPM score as predictor variable is indeed better than the logit model of "intercept-only" or a model with no predictor at all.

Moreover, the conditional logit in Table 12 is given by $\log(p/(1-p)) = <0.0001 + 0.1241 * \textit{SFFG score} - 0.9712 * \textit{No. of takes} + \varepsilon_{ij}$. This fitted model says that holding the number of takes at a fixed value, an increase of 13% in the odds of passing the board exam and CBME can be expected for a one-unit increase in SFFG score since $exp(0.1241) = 1.13$. On the other hand, holding the SFFG score at a fixed value, a decrease of 38% in the odds of passing the board exam and CBME can be observed. However, the pseudo R squared of 40% indicates that the model is not far better than the intercept-only model. Using the two significant predictors cannot strongly predict the odds of passing the board exams and CBME.

Table 11

Logistic Regression Between Passing the Board Exam and the Written Mock Exams

Variable	Odds Ratio	Coefficient (B)	Standard Error (B)	z	P>|z|
FE scores	1.0351	0.0345	0.0319	1.08	0.2784
FPM scores	1.1793	0.1649	0.0542	3.04	0.0023
FUE scores	1.0016	0.0016	0.0327	0.05	0.9609
SFFG scores	0.9829	-0.0173	0.0483	-0.36	0.7209
Constant	<0.0001	-10.0638	3.1124	-3.23	0.0012

Maximum log likelihood = -38.2656 *LR chi2(4) = 20.28*
Number of observations = 70 *Probability > chi2 = 0.0004*
Pseudo R2 = 0.2095

Table 12

Logistic Regression Between Passing the Board Exam and the CBME

Variable	Odds Ratio	Coefficient (B)	Standard Error (B)	z	P>|z|
FE scores	1.1500	0.1398	0.0823	1.70	0.0894
FPM scores	1.1400	0.1310	0.0776	1.69	0.0911
FUE scores	0.9683	-0.0322	0.1005	-0.32	0.7483
SFFG scores	1.1321	0.1241	0.0601	2.06	0.0389
No. of FE retakes	0.3786	-0.9712	0.4792	-2.03	0.0427
No. of FPM retakes	1.3897	0.3291	0.2482	1.33	0.1848
No. of FUE retakes	0.7033	-0.3520	0.4763	-0.74	0.4599
No. of SFFG retakes	1.3584	0.3063	0.2238	1.37	0.1710
Constant	<0.0001	-23.3904	12.3979	-1.89	0.0592

Maximum log likelihood = -29.142704 *Probability > chi2 = <0.00001*
Number of observations = 70 *LR chi2(8) = 38.53*
Pseudo R2 = 0.3980

Conclusions and Recommendations

Overall, students have average levels of preparation before taking mock exams, which welcomes improvement. Furthermore, most students expect to pass their mock exams only by a margin. This result could partly be due to the predominating passing score of 60% for most subjects. Pre and post-test responses of students' perception reveal rationality and sensibility, being consistent in the responses, which is reflected in their overall score performance. Hence, students must continually be encouraged to improve their level of preparation for their exams.

Most examinees find the mock exams to be at least tricky. Students found the exam tricky to difficult because they were mostly attributed to the exam difficulty, the analysis required, and its coverage. Students' confidence in passing their mock exams was mostly anchored on internal factors such as their study habits, exam preparations, and stock knowledge. They also consistently ranked these factors as the most important factors that affect their mock exam performance. The foremost factor that was identified as affecting their exam performance was exam preparation, an internal factor, followed by the difficulty of the subjects in each area exam, wide coverage, difficulty and trickiness of the exam, and delivery of external subjects to the students. They also recognized stock knowledge gained as an essential internal factor in the exam performance. Teaching strategies that can motivate guided learning yet promote self-reliance are needed to progressively prepare students for board exams.

Students were also able to rank difficult subjects and subjects they were least prepared for and explain why they found them as such. Difficult subjects and subjects where they were least prepared need further intervention. This must be addressed in the department that handles them. Departmentalized exams can be given to monitor progress. Notes by subjects and references can be made accessible in preparation for mock and board exams. However, students must also be made aware of electronically available references for board exam preparation.

As performance and expectations are compared, most of the examinees' written mock exam was in the range of 41-60%, which is much lower than the perceived expected score of 61-90%. In CBME, 55% to 89% of examinees have scores below 75%. This result indicates some important preparatory skills missed out by many students if they were left on their own. Furthermore, in almost all major subjects, the passing rate is 60%, which conflicts with the required average passing of 75% in the forestry board exam.

The significant direct correlations and the result of binary logistic regression between some area mock exams and the student's overall passing in the forestry board exam shows that mock exams likely benefited the students in their preparations for the board exams. The negative effect of the number of retakes in the computer-based exams on passing the forestry board exam indicates a need to screen students regularly and emphasize efforts on students' study preparations. Both the written and the computer-based exams gave students important feedback that they can consider in their preparations for board exams. However, the scope and extent of the review made, especially in FUE, needs improvement to capture the scope and difficulty of the actual board exam.

The estimated logit indicates that FPM and SFFG scores for the written exam directly affect passing the board exam. Whereas the number of FE retakes in CBME negatively affects the probability of passing the board exam. The written mock exam and CBME contributed a small positive contribution to student performance to the actual board exam. Thus, a need to continue this effort and further improve exam questions included in the mock exams. Result also indicates that CBME can reflect better students' performance in the board exam.

Moreover, the conditional logit says that holding the number of takes at a fixed value can increase the odds of passing the board exam by 13%. Since the PRC has no regulation on limiting the number of takes of forestry board examinees, the university should safeguard that students are screened and trained sufficiently to pass the board exams. Although there were significant predictors identified in the study, they were not good indicators solely for predicting the odds of

passing the board exams. Instead, it should be a combination of all areas, so delivering of the mock exams for other areas needs to be improved.

Values that will encourage students to do their best during their first take in the board exam must be instilled, and this can be done by giving a numerical grade for Course Audit. The number of times students retake the same exam yet failed to pass indicates some students' ill preparations prior to taking their mock exam. If this attitude predominates and is carried over in taking the board exam, the yearly poor performance of even a few students will continually pull down BSU's board exam performance. In this context, stringent screening of incoming first-year students of board-exam-based courses like forestry is needed. Alternatively, some differential mentoring schemes for students with learning disabilities can be made operational, like faculty-student and student-student mentoring schemes. Year-level screening can also be implemented side by side with this. Further results showed that fresh graduates always have better chances of passing the board exam. Thus, fresh graduates must be encouraged to take the board exam the soonest.

The marked increase in the number of students and board exam repeaters pose a risk on BSU's overall standing in the field of forestry. Intervention to help old graduates was in place but a more holistic intervention may require stringent screening of BSF students, as practiced by other state universities. It is further recommended that the college continue offering FOR 143 and 144 to improve students' preparation for the board exam. However, examination questions must be improved, especially for FUE and SFFG. Outsourcing of reviewers and updating mock exams will help a lot. Giving opportunities for previous examiners to interact with the faculty and students taking course competency can also help.

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