The Impact of Co-Curricular Activity Assessment on Male University Students’ Course Performance:
A Case Study of The Natural Sciences Course

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Abstract
Our objective was to examine if a co-curricular activity incorporated with assessment methods affected students’ competence in a course. Natural Sciences (201) was chosen as a candidate course for this study. Students’ grade breakdown was examined and analyzed using SPSS and MINITAB software over four academic years from Fall 2012-13 to Fall 2015-16. The number of failed male students was significantly lower ($p<0.05$) in Fall semesters when compared with the number of failed male students in Spring semesters. A further analysis was attempted as an approach to understand the reasons for the remarkable elevation of success in the Fall semesters. Hence, a questionnaire was given to 121 students and the data showed that the ‘Science Communicators Program’, metaphorically the Science Festival, played a key role in the students’ achievements. The excellence of performance in the Natural Sciences course was detected during the Fall semesters. Thus, this research paper recommends the accommodation of off-campus co-curricular activities in other courses taught at the university.

Keywords: higher education, co-curricular activities, assessments methods, course performance

1. Introduction
A limited number of studies have focused on the efficacy of co/extra-curricular activities on the academic performance and retention of students (Cole & Fanno, 1999; Hunt, 2007; Marsh and Kleitman, 2002; Pascarella & Terenzini, 2005, Elkins et al., 2011). It has been reported that students’ academic and social engagements contribute to their integration into university life. This is because students involved in co-curricular activities drop-off from colleges at a lower rate when compared to students who don’t participate in co-curricular activities (Cole & Fanno, 1999; Hunt, 2007. Some research standardized and self-reported research studies have shown that a number of out-of-classroom interactions between students and their peers might positively reflect on students’ learning capabilities (Pascarella & Terenzini, 2005, Elkins et al., 2011).

Nowadays, it is believed that co-curricular activities significantly influence on students’ academic performance and soft skills (Marsh and Kleitman, 2002; Kumar 2004). A research study conducted by the United States of America’s education department showed that students who actively participated in the co-curricular activities were more likely to have a Grade Point Average (GPA) of 3.0 or higher when compared to those students who do not take part in co-curricular activities (Stephens & Schaben, 2002). Moreover, one study (Broh, 2002) revealed that the co-curricular activities could lead to an increase in students’ class attendance. Interestingly, some studies (Hollway, 2002; Guest & Schneider, 2003; Baur & Liang, 2003) illustrated a direct relationship between co-curricular activities and soft skills, higher motivation and better understanding level.

When compared to on-campus co-curricular activities, off-campus co-curricular activities had more impact on personality development (Connor & Fringer, 2015). This is because off-campus activities provide students with opportunities to interact with people of different ages, gender, professions, ethnicities, and nationalities thereby enhancing their soft skills. On the contrary, on-campus activities are confined within the boundaries of the campus
with like-minded persons of similar age, ethnicities and nationalities; this is especially so in a local institute. Nevertheless, there may be a diversified population in an international institute.

In Natural Science course, the co-curricular activity “Science Festival” is designed and organized under the supervision of the Course Coordinator in such a way that students can get better understanding of the course and enhance their non-academic skills as well (Ingale, 2014; Dhanmeher, 2014). This particular co-curricular activity is usually connected with academic matters and give the students practical exposure of the ideas and theories that they study in their respective course.

2. Research Methodology

The purpose of this study was to determine the effect of co-curricular activities on the academic achievements of the male university students. We collected four years’ worth of data spanning from fall 2012-13 to fall 2015-16 to compare the academic performance of Natural Science students who participated in an off-campus co-curricular activity known as ‘Science Communicators Program’ (SCP) to the academic performance of the students in the same group who did not participate in this program. The SCP is an annual, educational community event is offered only during the fall semester. In the SCP, Natural Science students assume the role of Science communicators and deliver scientific content in a fun, entertaining and professional way to children aged between 5 and 15 years.

We compared the academic performance of the male students in the Fall semesters (SCP-participants) to those in the spring semester’s (SCP-non-participants), using chi-Square Test on SPSS software and two Populations Proportion Test on MINITAB. Our results showed that the proportion of students who performed poorly (4.4%) in the fall semesters was significantly lower than that in the spring semesters (11.7%). (p<0.05).

It is believed that students who are taking the Natural Science course, as a University College requirement, are stringently burdened with the maximum number of credits and fear the failure ghost of the previous semester. Therefore, they do not dedicate time to do their projects in an innovative way.

Table 1.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B+, B</td>
<td>11, 18, 38</td>
<td>4.0, 6.5, 13.8</td>
<td>4.0, 6.5, 13.8</td>
<td>4.0, 10.5, 24.3</td>
</tr>
<tr>
<td>C+, C, D+</td>
<td>51, 70, 42</td>
<td>18.5, 25.5, 15.3</td>
<td>18.5, 25.5, 15.3</td>
<td>42.8, 68.3, 83.6</td>
</tr>
<tr>
<td>D, F</td>
<td>33, 12</td>
<td>12.0, 4.4</td>
<td>12.0, 4.4</td>
<td>95.6, 100.0</td>
</tr>
<tr>
<td>Total</td>
<td>275</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1.
Table 2.

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B+, B</td>
<td>12, 21, 32</td>
<td>5.4, 9.5, 14.4</td>
<td>5.4, 9.5, 14.4</td>
<td>5.4, 14.9, 29.3</td>
</tr>
<tr>
<td>C+, C, D+</td>
<td>37, 40, 29</td>
<td>16.7, 18.0, 13.1</td>
<td>16.7, 18.0, 13.1</td>
<td>46.0, 64.0, 77.1</td>
</tr>
<tr>
<td>D, F</td>
<td>25, 26</td>
<td>11.3, 11.7</td>
<td>11.3, 11.7</td>
<td>88.4, 100</td>
</tr>
<tr>
<td>Total</td>
<td>222</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2.

A further analysis was done to explain the reasons for students’ success in the fall semesters using a 10-questions questionnaire administered to 121 students who participated in Science Festival between fall 2012-13 and fall 2015-16.

3. Null Hypotheses of Study

To achieve the objectives of our study, the following hypotheses were tested:

$H_{o1}$: there is no difference between the final grades of male students’ who were enrolled in the fall semester (SCP participants) and spring semester (non-SCP participants) in Natural Science course.

$H_{o2}$: there is a difference between the final grades of male university students who participated in the SCP and who did not participate in the SCP.

$H_{o3}$: participation in the Science Festival did not improve the academic performances of the students enrolled in the Natural Science.

$H_{o4}$: There is no difference between the effect of off-campus co-curricular activities and on-campus co-curricular activities on the academic achievements of the university students.

4. Results and Discussion

$H_{o1}$: There is no difference between the final grades of male students’ who were enrolled in the fall semester (SCP participants) and spring semester (non-SCP participants) in Natural Science course.

SPSS Results:
### Case Processing Summary

<table>
<thead>
<tr>
<th>Cases</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Valid</td>
<td>Missing</td>
<td>N</td>
<td>Percent</td>
</tr>
<tr>
<td>Grades * Semester</td>
<td>497</td>
<td>0</td>
<td>497</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

### Grades * Semester Crosstabulation

<table>
<thead>
<tr>
<th>Count</th>
<th>Semester</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall</td>
<td>Spring</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>Grades</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>12</td>
<td>26</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>263</td>
<td>196</td>
<td>459</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>275</td>
<td>222</td>
<td>497</td>
<td></td>
</tr>
</tbody>
</table>

### Chi-Square Tests

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>df</th>
<th>Asymptotic Significance (2-sided)</th>
<th>Exact Sig. (2-sided)</th>
<th>Exact Sig. (1-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>9.393*</td>
<td>1</td>
<td>.002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuity Correction</td>
<td>8.381</td>
<td>1</td>
<td>.004</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>9.434</td>
<td>1</td>
<td>.002</td>
<td>.003</td>
<td>.002</td>
</tr>
<tr>
<td>Fisher’s Exact Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*N=497 cases.*

- a. 0 cells (0%) have expected counts less than 5. The minimum expected count is 10.97.
- b. Computed only for a 2x2 table

---

Figure 3.

MINITAB Results:

```
Welcome to Minitab, press F1 for help.

Test and CI for Two Proportions: Fall, Spring

Event = 1

Variable X  N  Sample p
Fall  12 275 0.043636
Spring  26 222 0.117117

Difference = p (Fall) - p (Spring)
Estimate for difference: -0.0734808
95% upper bound for difference: -0.0326661
Test for difference = 0 (vs < 0): Z = -3.06  P-Value = 0.001
```

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Figure 4.
The above table provides enough evidence against null hypothesis (H₀₁). Therefore, we reject null hypothesis and hence we conclude that there is a significant difference between the students’ final grades of Spring and Fall semesters in Natural Science course.

In Spring semesters, Science Fair replaced the Science Festival and the students had to design certain projects and experiments to demonstrate science ideas related to the four topics covered by the course. Many students failed to meet the rubric or to submit their work on time,, The main reason was their dedication to the major courses rather than the Natural Science course which is a pre-requisite course for Aviation program only.

H₀₂: There is no difference between the academic final grades of university students who participated in the SCP and who did not participate in the SCP co-
Figure 6.
We reject the null hypothesis and hence conclude that there is a significant difference between the academic achievements of the male university students who actively participated in co-curricular activities as compared to those students who did not.

$H_{03}$: Participation in the Science Festival did not improve the academic performances of students in enrolled in the Natural Science course.

Figure 7.
We reject the null hypothesis and hence conclude that there was a significant improvement in the academic performance of the students enrolled in the Natural Science course who participated in Science Festival when compared to the academic performance of the students who did not participate in the science festival.

**H04:** There is no difference between the effect of off-campus co-curricular activities and on-campus co-curricular activities on the academic achievements of the university students.
5. Conclusion
The data collected from the Natural Sciences course over four academic years depicts the number of students who failed during the fall semesters was lower than that in the spring semesters. There was a significant difference between the academic achievements of students who participated in co-curricular activities when compared to the academic achievements of those students who did not. Based on the survey results, the Science Communicators Program (a.k.a The Science Festival), contributed to the excellent results achieved by students who undertook the Natural Sciences course during the fall semesters. Similarly, we found that when compared to on-campus co-curricular activities, off-campus co-curricular activities played a more vital role in contributing to the academic achievements of the university students.

References
Dessa Bergen-Cico, Joe Viscomi (March 5, 2013). Exploring the Association between Campus Co-Curricular Involvement and Academic Achievement. https://doi.org/10.2190/CS.14.3.c


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