

# Exploring Batangas State University Graduates' Perceptions on BS Chemistry Learning Outcomes

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**Abstract**— This research aimed to explore the perceptions of Bachelor of Science (BS) in Chemistry graduates on the knowledge and skills they have developed through-out their programme of study at the Batangas State University. In this study, graduates from the BS in Chemistry program of Batangas State University (n=46) were asked of their personal perceptions toward their initial skills at the start of their study, their improvement throughout the programme, and their current confidence level in applying these outcomes in their current jobs or posts. The results revealed a pattern of high levels of student agreement to each learning outcome which suggested that comprehensive learning outcomes are important to BS Chemistry graduates. However, there was a gap between the graduates and their confidence levels toward applying their skills outside of the university, based on their perceptions. Furthermore, the graduates expressed that their confidence levels on employability skills such as writing, quantitative skills, and team work were still not enough and should be a point to be improved and strengthened in the university's program curriculum in the future.

**Index Terms**— BS Chemistry Graduates, Confidence, Inclusion, Improvement, Importance, Learning Outcomes, Skills

## 1 INTRODUCTION

GIVEN that a primary aim of the BS Chemistry program of Batangas State University is to prepare its students to assume professional responsibilities in any chemical industry and institution, it is of utmost importance that they develop their skills based on what is expected to them as written in the CHED Memorandum Order No. 18, Series 2007, Policies and Standards for Bachelor of Science in Chemistry. The objectives of the Policies and Standards are to set minimum level of quality for the BS Chemistry program and to enable institutions to produce chemists who can practice the profession under the current global standards. The BS Chemistry graduates can be employed at entry level positions as analytical or laboratory chemist in the private industries and companies that deal with pharmaceuticals, food and beverage, cosmetics, oil and petroleum, mineral and metals, environmental analysis, textile, quality control, chemical manufacture, agricultural products research, hospitals, pulp and paper, among others [1].

BS Chemistry graduates are expected to acquire a wide range of abilities and skills identified in the Euro bachelor program [2]. The core competencies are grouped into three broad categories: Chemistry-related cognitive abilities and skills, Chemistry-related practical skills and generic skills. To attain these abilities and skills, the curriculum of the BS Chemistry should be based around a well-defined core of subjects which tackle the fundamental aspects in sufficient depth and at the same time allow for flexibility to cover areas and applications in the allied disciplines.

In this regard, the researchers find it necessary to evaluate the BS Chemistry curriculum offered by the University. This research adopted the Science Students Skills Inventory (SSSI). The SSSI was developed in Australia to more genuinely explore the perceptions of graduates regarding the learning outcomes valued by the scientific community and the academe. The SSSI prioritizes learning outcomes and skills in science, and is designed to offer meaningful data that could be used to enhance teaching and learning at the level of the degree program [3]. In Australia, the Universities are required to express the learning outcomes for the degree programs they offer and to provide evidence of student achievement for those stated learning outcomes. The SSSI is a purpose-built instrument and was presented at the Australian Conference on Science and Mathematics [4]. The SSSI initially used at University of Queensland with the graduating Bachelor of Science in 2008. The validity of the survey was based on its usefulness of the results and its continued use at UQ not only to Bachelor of Science but also with the Bachelor of Biomedical Sciences [5-8].

Since the learning outcomes presented in the SSSI are almost similar to the learning outcomes in the CHED CMO No.18, Series 2007 for BS Chemistry program, the researchers adopted the SSSI instrument to collect information on the perceptions of the BS Chemistry graduates from Batangas State University. The researchers focused on the six specific areas (ethical thinking skills, team work skills, quantitative skills, scientific content knowledge, communication skills and writing skills) across four indicators (importance, confidence, improvement and inclusion in the curriculum).

This research was designed to gather data from BS Chemistry graduates of Batangas State University. The researchers aimed to explore the perceptions of graduates have of the knowledge and skills they develop throughout their programme of study and how these align with their perceptions of the importance they place on the skills, the improvement they made throughout the programme and the level of confidence they have in applying them.

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## 2 METHODOLOGY

### 2.1 The survey

The study utilized a quantitative methodology, using the Science Students Skills Inventory which is modelled on the Student Assessment of Learning Gains [9-10]. The following six graduate skills were explored: ethical thinking skills, team work skills, quantitative skills, scientific content knowledge, communication skills and writing skills. For each of the six skills, set of questions were asked which led to the four indicators: importance, confidence, improvement and inclusion in the curriculum. Students were asked to answer each of these questions on a 4-point numeric scale which did not contain neutral point to ensure that the respondents would give a definitive choice.

### 2.2 Participants

The graduates of BS Chemistry program of Batangas State University AY 2016-2017, 2017-2018 and 2018-2019 were the respondents chosen for this study. The survey questionnaires were distributed electronically to the respondents, and 42 responses (91%) had been received.

### 2.3 Analysis

Descriptive statistics methods were employed to summarize and visualize the data, including means of the 4-point scales of each six skills and four indicators. A percentage agreement was also calculated as the percentage of students who selected 3 or 4 as their responses.

## 3 RESULTS AND DISCUSSION

### 3.1 Seven skills across all four indicators

Table 1 gives the mean for each of the six skills and across all four indicators.

TABLE 1  
SUMMARY OF RESPONSES FOR OVERALL SAMPLE  
ACROSS INDICATORS

Learning Outcomes	Improvement	Importance	Included	Confidence
Communication skills	3.41	4.00	3.59	3.27
Ethical thinking	3.55	3.95	3.55	3.27
Writing skills	3.50	3.95	3.77	3.14
Team work skills	3.64	3.86	3.73	3.55
Scientific content knowledge in chemistry	3.77	4.00	3.91	3.23
Quantitative skills	3.45	3.95	3.82	3.09

Based on table 1, the graduates assessed themselves to have improved their communication skills moderately with a mean value of 3.41 but had greatly improved their scientific content knowledge in Chemistry all throughout their stay in University. They considered activities which could nurture their communication skills and the scientific content to be highly important in their program. Based on the assessment of the graduates, among the skill-building activities which were included in the program curriculum, those relating to scientific content knowledge in chemistry needed be developed most. Less urgency were shown for activities relating to ethical skills. The graduates have assessed themselves to be moderately confident on most of the six skills.

### 3.2 Perceptions of improvement, importance, inclusion and confidence

#### 3.2.1 Improvement

Fig. 1 shows the students' perceptions on how much they have improved each skill over the course of their program. Based on the results, most of the students agree that their scientific content knowledge in chemistry had greatly improved (77%). All other skills show percentage agreement greater than 50% with ethical thinking skills resulting to 55%, team work skills at 64%, and quantitative skills at 55%. This suggested that the curriculum of the BS Chemistry program includes activities which improve the skills of the students, specifically on the content and quantitative skills which capacitate them in laboratory and scientific research works.

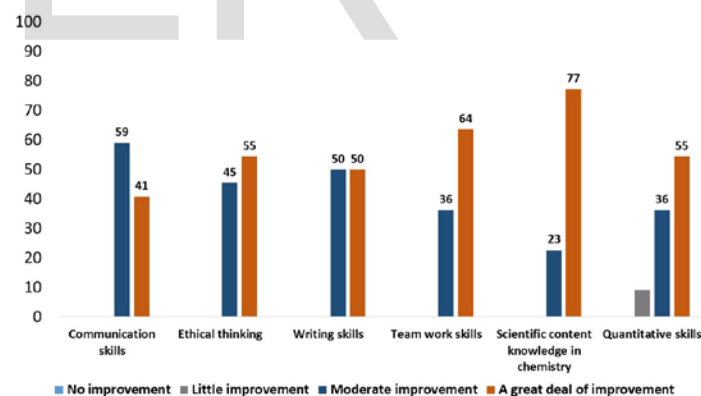


Fig.1. Graduates perceptions on the improvement of their skills

#### 3.2.2 Importance

Based on Fig. 2, the students assigned the highest importance to the activities which nourished their communication skills and scientific content knowledge in Chemistry.

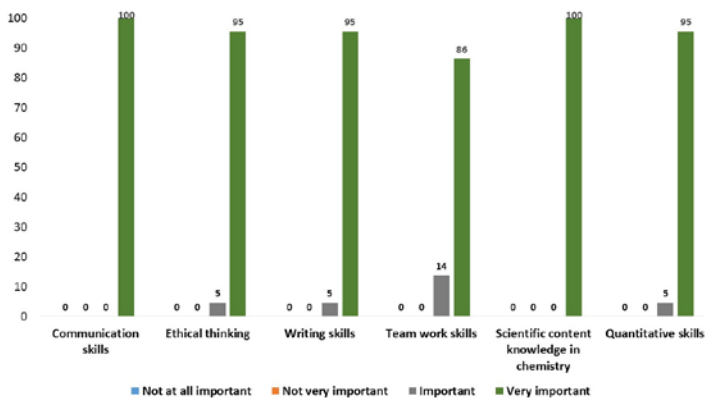


Fig. 2. Graduates perceptions on the importance of activities that will develop their skills

### 3.2.3 Inclusion

Based on fig. 3 shows the graduates' perceptions of how much the skills were included in the curriculum across the chemistry subjects. Again, there is overall agreement that scientific content knowledge in chemistry (91%) were included throughout the entire program. Activities to enhance quantitative skills (82%) were also given emphasis on the program. But 5% of the respondents considered that there were little activities given to enhance their ethical skills.

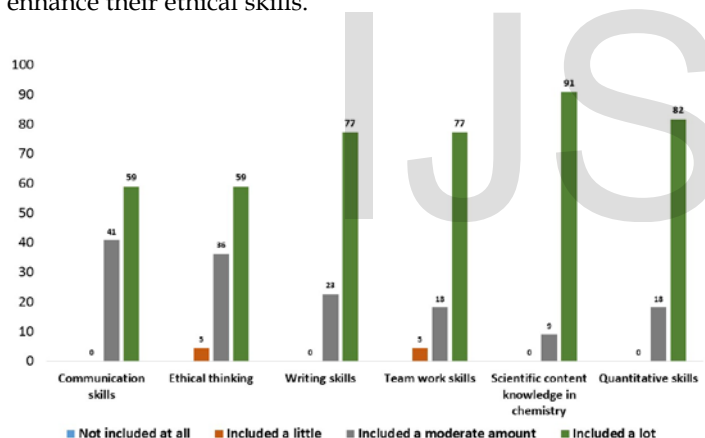
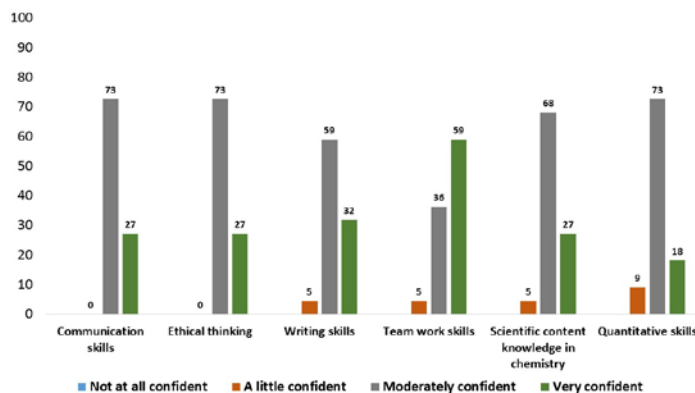


Fig. 3. Graduates perceptions on inclusion of activities that enhances their skills

### 3.2.4 Confidence

The graduates' confidence, using the six skills, is shown in Fig. 4. Most of the respondents were moderately confident based on the percentage agreement of 73% - 59%. They felt very confident with respect to their team work skills (59%). However, this low levels on their confidence toward their skills was very alarming as it could affect their drive and competitiveness in their work environments and also toward international setups.

Fig. 4 Graduates' perceptions on how confident they are with their skills



## 4 CONCLUSION

Overall, the findings reveal a pattern of high levels of student agreement that comprehensive learning outcomes are important and activities that will enhance these activities must be included but there is a clear gap between graduates' perceptions of their confidence on their skills although they considered themselves improves a lot on their scientific content knowledge in chemistry and quantitative skills. This study shows that from the perspective of the graduates key employability skills such as writing, quantitative skills team works were lacking on confidence indicator. Whether it is true that these skills have not been included and assessed in their degree program, the fact remains that graduates in this study are indicating that they lack confidence in applying these important skills. There is a need to develop deeper communication between academic staff, students and employers to better understand the workplace expectations of the BS Chemistry graduates.

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