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# Tracer Study for Graduates of the Bachelor Degree Program at Chemistry Education

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**Abstract.** This study aims to obtain an overview of the profile of graduates and their competitiveness in the community and their improvement strategies. The study was conducted on a Chemistry Education study program held through distance education. The sample used was 36 graduates from a total population of 119 people scattered in the urban, and rural areas. The questionnaire contained 16 questions that were content validated by distance education experts and used a scale of 4. Additional data was obtained through in-depth interviews with two policy makers at the institution related to the research findings. The results obtained showed that the lowest graduate self assessment was in English skills of 2.52, the community empowerment process was 2.74, and the research methodology was 2.85. While the highest competency requirements for graduates are in learning planning is 3.70, the ability in information technology is 3.70 and learning evaluation is 3.73. The difference between self-assessment and the needs of graduates shows that there is a gap, and the highest gap value is in English language skills of 0.98, the research methodology is 0.69 and the use of information technology is 0.68. The efforts and strategies of institutions to improve the quality of graduates starting with improving the curriculum in learning programs include changing the content of English language teaching materials that are initially general into material for daily conversations, adding subjects in the Digital Age Learning and adding credits to research methodology subjects.

Keywords: graduates' response, self competency assessment, and the needs of graduate competency, improvement strategies.

## INTRODUCTION

One of the tools that educational institutions use to assess the career outcomes of the graduates (alumni) are tracer studies. Tracer studies are essential for educational institutions as they provide feedback on the effectiveness and efficiency of the programmes they offer. Tracer studies are an empirical study that can produce valuable information in evaluating an educational program (Noko and Ngulube: 2015). Information from tracer study is an important for program improvement and fulfillment of skills for graduates in the workplace (Schomburg, 2003). According to Schomburg (2003), searching graduates can provide information for the benefit of evaluating the results of higher education and furthermore it can be used to improve the quality of higher education institutions concerned. Davis, R., Misra S, Van Auken S, (2002), described that periodic outcomes assessment was required by institution to continuous improvement in a marketing curriculum. Study about professional skill development and academic career based on their tracer had been done by Tung, H.C. *et al.* 2011. The study showed that residents identified didactic teaching, leadership, and independent learning as the top three professional skills that they developed and these skills valuable in their current career. These findings were used as a basis for improving their programs.

Chemistry study program was conduct tracer study. The purpose of this study is to find and describe: 1). competitiveness of graduates in Chemistry Education, 2). graduates's expectations of the abilities he obtained from the institution of study and, 3). institutional strategy in developing program improvements

## METHOD

The study was conducted on a Chemistry Education study program held through distance learning. The sample used was 36 graduates randomly from a total population of 119 graduates scattered in the urban, and rural areas. The data obtained through questionnaires to graduates. Indicator used are graduates self-assessment on 1) general

knowledge of educational contexts, 2) the ability of to design and implement teaching learning, 3) the ability of social skill, and 4) the expectations of graduates on the capabilities obtained from the Institution. The questionnaire contained 16 questions that were content validated by 2 distance education experts and used a scale of 4 ranging from very important (4), important (3), less important (2) and not important (1). Additional data were obtained through in-depth interviews with two policymakers at the institution related to the research findings. The data obtained were analyzed descriptively by considering the tendency of answers for each variable. Data will be presented in frequency and percentage.

## RESULTS AND DISCUSSION

Chemistry Education Study Program offers teacher education in-service programs, the majority of graduates (97%) are teachers who teach in the field of chemistry. All graduates (100%) stated that they did not want to move to work and 91 % even graduates were satisfied with their work. Graduates stated strongly agree (30%) dan agree (69%) with their expectation when they studied at program. These indicates that the majority of respondents were satisfied with the skills and knowledge they acquired. Graduates like to work in fields that are in accordance with the field of study (Aina and Moahi, 1999; Stilwell, 2004).

### Competitiveness of graduates in Chemical Education

Graduates/ self-assessment of their abilities were described as follow

a. Graduates self-assessment on general knowledge of educational contexts.

Study conducted by Munge, B (2009), described that in many cases experience and attributes were used as a requirement for employee acceptance. However, graduates' competencies are not always meet with the field needs. In this study the biggest graduates' self-assessment of general knowledge competencies, was shown in the indicator of oral communication skills ( $X=3,11$ ) and written communication skills ( $X=3,08$ ).

Communication skills are important in all human endeavours. Communication has impacts in all works, and an effective communication can enhance organizational outcomes (Pandey & Garnelt, 2006). Graduates also gave high marks on the ability of general knowledge reaches ( $X=3,05$ ), and information technology capabilities ( $X = 3,05$ ). The lowest marks on English ability ( $X=2,54$ ), and the ability to understand research methods  $X = 2.85$  on a scale of 4. as shown in Figure 1.

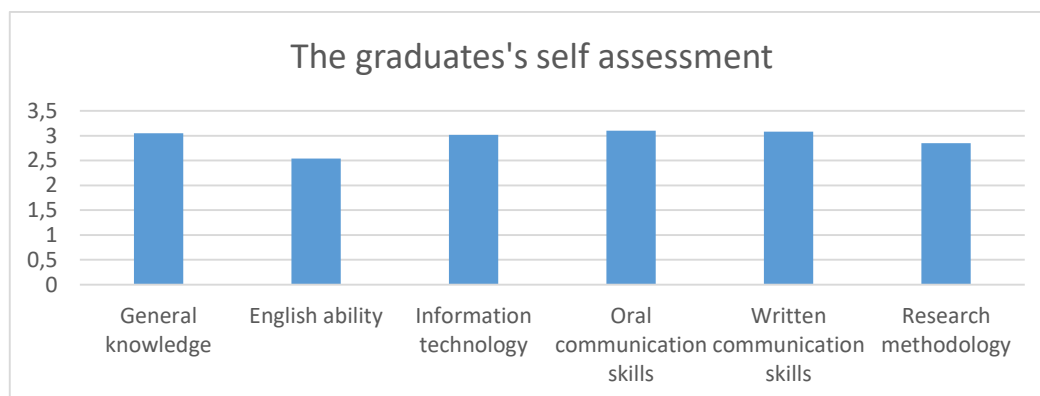


Figure 1. Graduates self-assessment on general knowledge of educational contexts.

Through these numbers then it may said that graduates's general knowledge on general knowledge of educational contexts are classified as good, except for English language skills. This existence illustrates that graduates feel that they have knowledge skills that are not inferior to other colleagues in their work environment.

b. Graduates self-assessment of the ability of to design and implement teaching learning

Graduates' knowledge of their students' need are an important thing in relation to their ability to match instruction to their students.

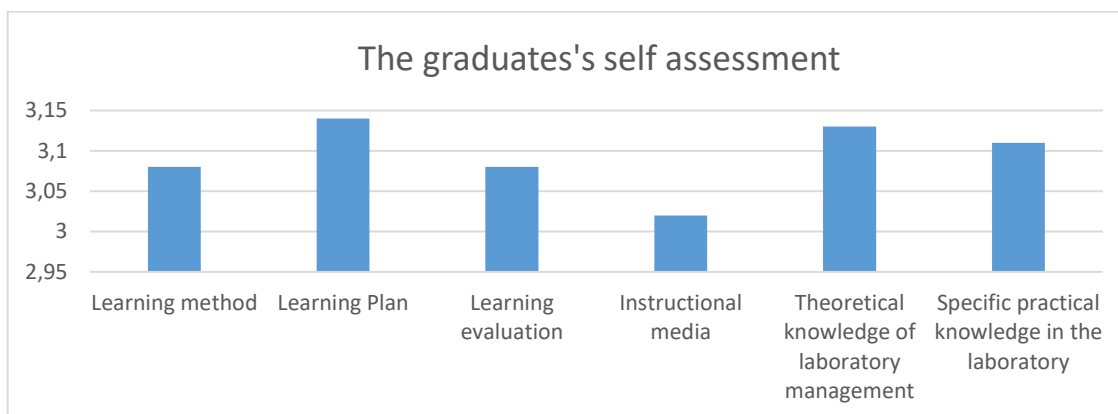


Figure 2. Graduates self-assessment of the ability of to design and implement teaching learning

Graduates's self assessment of the ability in designing and implementing teaching learning were shown by several indicators including the ability to plan learning at  $X = 3.14$ , the ability to use learning methods at  $X = 3.08$ , the ability to use learning media at  $X = 3.02$ , carrying out evaluations learning  $X = 3.08$ , theoretical knowledge of laboratory management  $X = 3.13$ , specific practical knowledge in the laboratory  $X = 3.11$ , on a scale of 4. Through the Figure 2, it could be explained that graduated had fulfilled their needs as a chemistry teacher in relation to the courses especially in teaching learning.

#### c. Graduates self-assessment of the ability of social skill

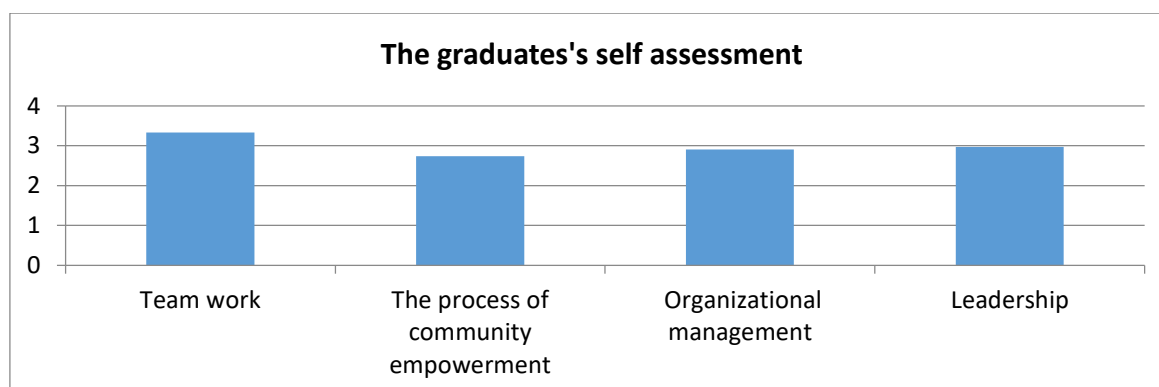


Figure 3. Graduates's self-assessment on social skills

Tracer study conducted by Buenviaje M, Mundo, G. and Anonuevo F, (2015), found that information technology, human relation, critical thinking and communication skills are very useful in their job placement. In this study, graduates's self-assessment of social skills in their workplace were shown by several indicators, including teamwork capabilities showing an average value of  $X = 3.31$ , while the ability to process community empowerments  $X = 2.73$ , organizational management ability  $X = 2, 91$  and leadership  $X = 2.97$  from scale 4. Through the figure 3, it might be explained that although the rate of graduates' self-assessment of social skills was quite good but the average score below 3,00.

### Expectations of Graduates on the Capabilities Obtained from the Study Institution

The value of reality (X) on the graduates' abilities and the value (Y) showed the graduates' expectation were obtained from the graduates' assessment. Based on these two values it was found that there was a gap value (d).

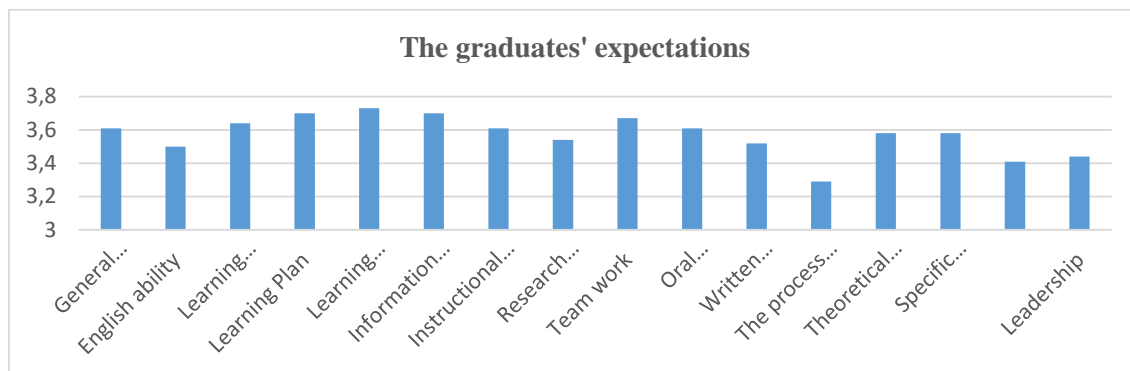


Figure 4. Graduates's self-assessment on their expectation

All indicators indicate that graduates have high expectations of achieving a score above  $Y = 3$  (Figure 4). The highest expectations of graduates on their learning outcomes were shown in their ability to carry out learning evaluations of  $Y = 3.73$ , planning to learn at  $Y = 3.7$  and using information technology as much as  $Y = 3.7$  (Figure 4). Through these data, it might be explained that graduates had high expectations from the institution programs. The graduates need deeper knowledge about the teaching learning concepts and its application, caused they work as teachers in the field of chemistry.

The higher gap value indicates the higher graduates' demands. The reality, the expectation and the gap values were as shown in Figure 5.

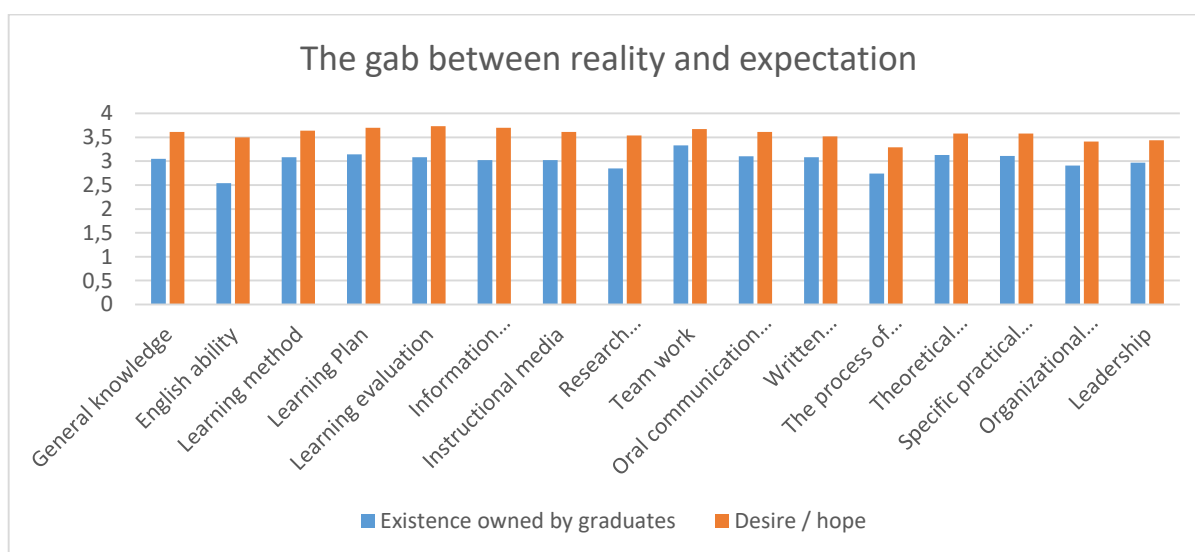


Figure 5. The comparison graduates's self-assessment on their abilities and their expectation

The difference between self-assessment on graduates' abilities and graduates' expectation showed that there was a gap, and the highest gap value was in English language skills of 0.96 ( $X = 2.54$ ,  $Y = 3.50$ ), research methodology is 0.69 ( $X = 2.85$ ,  $Y = 3.54$ ) and the use of information technology is 0.68 ( $X = 3.02$ ,  $Y = 3.7$ ). Comparing with graduates' abilities and graduates' expectations in these indicators, the graduates considered it was still necessary to be improved.

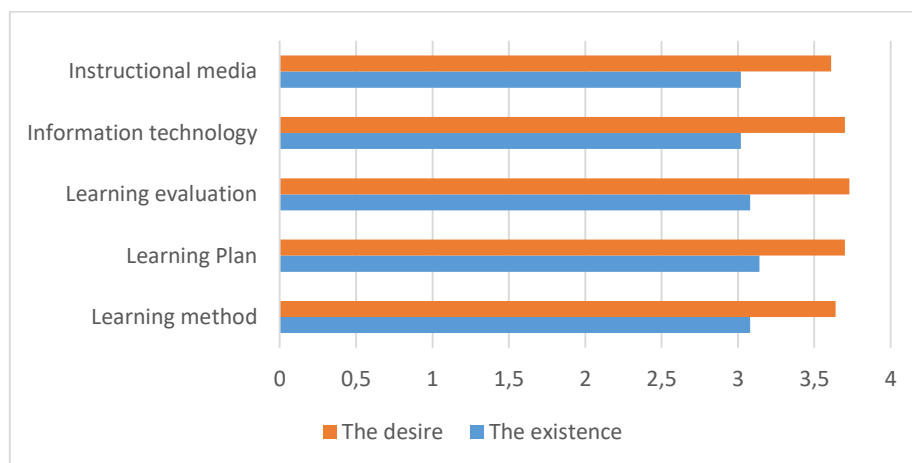


Figure 6. Differences between graduates' abilities and graduates' expectation on designing and implementing teaching learning

Graduates considered that the variable of designing and implementing teaching learning were still important. Eventhough graduates tended to give high value to carry out learning evaluations ( $X = 3.08$ ,  $Y = 3.73$ ), planning to learn ( $X = 3.14$ ,  $Y = 3.7$ ) and using information technology ( $X = 3.08$ ,  $Y = 3.7$ ) as shown figure 6, but these indicators still necessary to be improved. As a teacher, graduate should have understood to play a significant role in student learning. Graduates realized that they should used a pedagogical content knowledge to help students learn the chemistry matter. According Shulman (1987) quality teaching is a teacher's use of pedagogical content knowledge (PCK) to help students learn the subject matter. Ward, Kim et.al (2015) said that PCK as consisting of (a) it accomodates the concepts of knoledge and describes how this happens, and (b) provides a clear indication of what to measure. PCK as a body knowledge informed three questions. How teacher select content to be taught?. How they enact the content? And how teacher deal with students' understanding? (Shulman, 1986; Ward and Ayvazo, 2016).

Moreover Grossmand (1990) described PCK had four component knowledge those are (a) the purpose of teaching at different grade levels, (b) students' understanding of the content to be taght, (c) curricular materials, and (d) content understandable to students.

### Institutional efforts to improve the program

The efforts and strategies of institutions to improve the quality of graduates begin with improving the curriculum in learning programs, including by changing the content of English language teaching materials which were initially general to become material for daily conversation. This is in line with the opinion of Efrizal (2012) described that speaking is significant for people interaction where they speak everywhere and every day. Furthermore, he said that Speaking in English was a complex process. Everyone needs communication when they want to say something or convey information. Therefore the improvement in learning English became one component of the improvement of the study program curriculum so that students and graduates can compete with students and graduates from other educational institutions.

Beside the English skill, technology is essential during times of rapid changes in digital technology, and graduates confidence with technology. Using computers has become part of everyday life. Tracer study conducted by Gibbs, S, Steel G, Kuiper A, (2011) described that in many cases graduates' end-user, computing skill would be needed for entry into the workplace. Institution could review and revise the curricula such as an academic programmes that in line with the graduates needs (Noko and Ngulube, 2015).The development of science and technology requires educational institutions to adapt it as stated in the curriculum. Additional course "Learning in the Digital Age" would be chosen by the institutions to improve the progams. This course explained the basic concepts of technology in the digital era and its application in the education world.

### CONCLUSION

One way to find out the quality of graduates of an educational institution is through an graduatesearch survey (tracer study). This is useful to determine the competitiveness of the quality of graduates relevant to market needs. In addition, through tracer study information might be obtained about the weaknesses that might occur in the

education process. In this study, the lowest self-rating of graduates ( $X = 2.52$ ) and the highest gap was inability in English (0,96). Institutional efforts to improve the program were carried out by adding material to Language courses which were adding examples and exercises to use English in everyday life. This is as shown in the Basic Material Book (modules) which is accepted by students. Another high gap was also found in the research methodology and information technology subjects. Institutions improve it by giving Final Projects in the form of compiling research proposals, conducting research and preparing seminar papers with more intensive guidance and increasing the weight of the scoring of research method subjects which were originally 2 credits to 3 credits. While for information technology, institutions provide a new course called Digital Era Learning which provides concepts and exercises on the use of information technology including the use of vitur vitur listed on Microsoft.

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