# CLOSING THE SKILLS GAP: COMPETENCY ALIGNMENT BETWEEN ON-THE-JOB TRAINEES AND MECHANICAL TECHNOLOGY INDUSTRY DEMANDS

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***ABSTRACT:*** *This study evaluated the alignment of competencies of Mechanical Technology on-the-job (OJT) trainees with the competencies of the industry. The study used a descriptive-comparative research design and included 76 OJT trainees and 20 industry respondents. Descriptive statistics and Mann-Whitney U test were used to analyze data to determine the competency levels and significant difference between groups. The results reveal that OJT trainees achieved a highly acquired competency level (M = 3.32) with attitude (M = 3.46) and psychomotor skills (M = 3.28) as the highest rated domains. Competency requirements were identified as acquired (M = 2.84) by industry respondents with knowledge being the highest requirement (M = 3.33). The competencies of the trainees and the demands of the industry were significantly different (U = 62.00, p < .001). Large effect size was found (r = .645) indicating a gap in competencies. The largest gap was in attitude (+1.22), followed by psychomotor skills (+0.32), while knowledge was closely aligned (-0.10). The study also reveals that OJT helps in developing industrially relevant competencies, but the continuous enhancement of curriculum and the collaboration of industry and academe must be strengthened to fill in the competency gaps. The workplace assessment, competency validation and industry participation in the design of training can be improved in an effort to improve the employability and readiness of the Mechanical Technology graduates.*

**Keywords:** Mechanical Technology, Competency Assessment, Competency Gap, Industry-Academia Collaboration, On-the-Job Training

## INTRODUCTION

The rapid development of technology and the advent of Industry 4.0 have transformed the sector of mechanical technology, creating a greater need for graduates whose competencies are compatible with the evolving needs of industry. As manufacturing systems become increasingly reliant on technology, employers are looking for graduates who possess not only technical knowledge but also the practical skills and professional attitudes needed for successful workplace performance. Thus, higher education institutions are challenged to ensure that their training programs prepare students enough for industry demands is an important component of technical and vocational education, giving students the opportunity to put their classroom learning into practice in real work environments. Through OJT, the trainees are expected to develop competencies in knowledge, psychomotor skills and attitude. Knowledge includes the technical principles, machining processes and safety practices and psychomotor skills are the effective performance of technical tasks. In the same vein, professional attitudes like teamwork, adaptability, responsibility and willingness to learn are important for successful integration in the workplace [1]. The importance of competency-based training, notwithstanding, there are still concerns regarding the alignment of the competencies gained by trainees with industry expectations. Manufacturing technologies are constantly developing and therefore educational institutions are required to regularly assess whether graduates have the competencies demanded by employers. However, there is still little empirical evidence that compares trainees' competencies, industry assessments and current competency requirements in the mechanical technology sector. This study was carried out in an effort to bridge this gap by evaluating the competency matching the acquired competencies of Mechanical Technology on-the-job trainees and the demands of mechanical technology industries. In particular, it compares the self-assessed competencies of trainees with that of industry evaluations and identifies industry competency requirements in terms of knowledge, psychomotor skills and attitude. Results are anticipated to provide empirical evidence on curriculum enhancement, ongoing development of OJT programs and enhanced industry-academe partnership.

### Research Problem

The study aimed to establish competency matching Mechanical Technology on-the-job trainees and industry competency needs. The aim was to determine the existing skills gaps between academic preparation and the needs of the workplace. Specifically, it aims to determine the level of acquired competencies of Mechanical Technology on-the-job trainees, determine the competency requirements of the Mechanical Technology sector, determine if there is a significant difference between the acquired competencies of on-the-job trainees and the competency demands of the Mechanical Technology industry, and identify the competency gaps between the competencies of trainees and the requirements of the industry.

## METHODS

### Research Design and Setting

The study utilized a quantitative descriptive-comparative research design to determine the competency match of Mechanical Technology on-the-job trainees to industry competency requirements. The descriptive approach was used to evaluate the competencies gained by the trainees and the competency requirements of the mechanical technology industry and the comparative approach was used to determine the difference between the competencies of the trainees and the industry requirements to determine the skills gaps between the academic training and the needs of the workplace. The study was done in selected mechanical technology industries and machine shops in Zamboanga City, Philippines where the Mechanical Technology on-the-job trainees were assigned for their industry-based training. The workplace settings provided the appropriate context to assess the competencies demonstrated by trainees and to determine the skills, knowledge and workplace expectations required by the industry. The industries selected were considered as relevant data sources because they represent real production and service contexts in which mechanical technology competencies are applied and assessed.

**Respondents and Sampling Used**

The research involved 96 respondents representing two groups critical in measuring the fit of competency. The first group was composed of 76 on-the-job trainees in Mechanical Technology from two academic programs: Bachelor of Science in Mechanical Technology and Diploma in Technology Major in Mechanical Engineering and Technology. These respondents were selected because they are the ones who are involved in industry-based training and are applying their competencies in actual workplace. The second group included 20 industry-based respondents from selected machine shops and production industries. These participants were practitioners, supervisors and workplace assessors who were directly involved in the monitoring and evaluation of trainee performance during industry immersion. Their assessments offered an industry perspective on the skills needed in real-world mechanical technology workplaces. The study included both industry respondents and trainees to compare acquired competencies with industry competency demands. This gave empirical evidence in the identification of competency gaps and the extent of the alignment of academic preparation to workplace expectations.

**Research Instrument**

Two sets of modified survey instruments were used to identify the degree of competency match of the acquired competencies to the competency demands of the industry for Mechanical Technology on-the-job trainees and industry practitioners. Instruments were developed on the basis of relevant competency frameworks and relevant literature. The indicators for attitude competence were adapted from the “10 Key Job Competencies Everyone Needs to Know About”, while the indicators for knowledge and psychomotor skills were developed by the researcher based on the competency requirements of Mechanical Technology practices. The first instrument was administered to the on-the-job trainee respondents and was composed of two parts. Part I obtained the profile of the respondents and Part II measured the level of competencies acquired in Mechanical Technology. The assessment was done based on the identified competency areas with the use of a 4-point Likert scale: 4–Highly Acquired, 3–Acquired, 2–Moderately Acquired, and 1–Not Acquired. The second instrument was given to industry-based respondents who acted as workplace assessors of the competencies of the on-the-job trainees. Part I gathered the profile information of respondents, such as their position and area of assignment, while Part II evaluated the trainees’ competencies using the same four-point Likert scale based on actual workplace performance. The instrument also contained indicators that measured the competency requirements expected by the mechanical technology industry. The use of two complementary instruments allowed the study to obtain both trainee self-assessment and industry-based evaluation, enabling a quantitative comparison of acquired competencies and workplace expectations. This approach showed empirical evidence of identifying competency gaps and the extent of alignment of Mechanical Technology training outcomes with actual industry demands.

**Validity and Reliability of the Research Instrument**

To validate the research instruments, the researcher first submitted the questionnaires prepared to the research adviser for evaluation and improvement. The revised instruments were subsequently evaluated by internal and external validators to assess the clarity, relevance, appropriateness and alignment of the indicators with the objectives of the study. The external validators were Mechanical Technology practitioners, faculty members, professional machinists, machine shop owners, and mechanical engineers who had relevant expertise and industry experience in mechanical technology practices. They reviewed the instrument items to ensure that they reflected the competency requirements and workplace expectations of the industry. At the same time, internal validators reviewed the consistency, structure and appropriateness of the statements, including grammar and clarity of presentation. The final version of the questionnaire was pilot tested on 20 non-participant respondents with similar characteristics to the actual study participants after the recommendations of the validators were incorporated. The reliability of the instruments was computed by using Cronbach’s alpha through SPSS analysis. The reliability coefficient obtained was 0.893, which showed a high internal consistency and confirmed that the instrument items were reliable for assessing the competencies of Mechanical Technology on-the-job trainees and industry competency demands.

**Data Collection and Ethics**

Prior to data collection, the researcher obtained the necessary approval from the university administration such as the president’s office, the dean’s office, the program chair, the registrar, and the on-the-job training office to get permission and to identify the Mechanical Technology on-the-job trainees as the target of the study. Permission was also obtained from selected mechanical technology industries where trainees were deployed to facilitate the participation of industry-based respondents. After securing ethical clearance from the university’s research ethics committee, the researcher personally administered and retrieved survey questionnaires to ensure accurate and reliable data collection. Participation was voluntary and all respondents were informed of the purpose, procedures and importance of the study. Confidentiality and anonymity of collected information were strictly observed, and respondents were informed of their right to refuse participation without consequences. The quantitative data collected were encoded and analyzed using Statistical Package for Social Sciences (SPSS) to determine the alignment of the competencies of the trainees and the competency demands of the industry.

**Statistical Analysis**

The collected data were analyzed by applying appropriate descriptive and inferential statistical techniques. The profile of the respondents was described in terms of frequency and percentage. The mean and standard deviation were used to determine the level of acquired competencies of Mechanical Technology on the job trainees and competency demands of the mechanical technology industry. An adequate comparative statistical test was used to determine if there are significant differences between the competencies acquired by the trainees and the competency demands of the industry. Normality testing was used at .003 which was lower to the alpha level 0.05 that indicated data was not normal which drove into the utilization of non-parametric test specifically, the Mann-Whitney U-test. Further, competency gaps were identified through gap analysis by computing the gap between the competency levels attained by the trainees and the competency expectations of the industry. The results were used to pinpoint areas of Mechanical Technology training programs that can be strengthened to better meet the needs of the workplace.

## RESULTS

**Table 1. Level of Acquired Competencies of Mechanical Technology On-the-Job Trainees**

| Respondents | On-the Job Trainees Level of Competencies | Overall Mean | Descriptive Interpretation | Equivalent |
|---|---|---|---|---|
| On-the-Job Trainees Competencies | Knowledge | 3.23 | Agree | Acquired |
| | Psychomotor | 3.28 | Strongly Agree | Highly Acquired |
| | Attitude | 3.46 | Strongly Agree | Highly Acquired |
| | **Grand Mean** | **3.23** | **Agree** | **Acquired** |

The presentation of the results was based on the sequence of postulated research problems

Table 1 shows the competencies level of Mechanical Technology on-the-job (OJT) trainees. The findings show a general level of competency with a grand mean of 3.32, interpreted as Highly Acquired suggesting that the trainees generally possess the competencies expected in the workplace. Among the competency domains, attitude domain obtained the highest mean (M = 3.46) followed by psychomotor skills (M = 3.28), both were interpreted as Highly Acquired. In contrast, the lowest mean was found in Knowledge (M = 3.23) but still under the Acquired level.

**Table 2. Level of Competency Requirements Demands of Mechanical Technology Sectors on On-the-Job Trainees**

| Respondents | On-the Job Trainees Level of Competencies | Overall Mean | Descriptive Interpretation | Equivalent |
|---|---|---|---|---|
| Industry Competency Demand | Knowledge | 3.33 | Strongly Agree | Highly Acquired |
| | Psychomotor | 2.96 | Agree | Acquired |
| | Attitude | 2.24 | Moderately Agree | Moderately Acquired |
| | **Grand Mean** | **2.84** | **Agree** | **Acquired** |

Table 2 shows the competency requirements of the Mechanical Technology industry as perceived by the industry respondents.

| Level of Competence of OJT | N | U | Z | r | p-value | Decision | Interpretation |
|---|---|---|---|---|---|---|---|
| *On-the Job Trainees (OJT)* | *76* | *62.000* | *-6.327* | *.645* | *.000* | *Reject $H_0$* | *Significant* |
| *Industries* | *20* | | | | | | |
| *Total* | *96* | | | | | | |

**Table 3. Significant Difference between the Acquired Competencies of On-the-Job Trainees and the Competency Demands of the Mechanical Technology Industry**

The results indicate that the overall competency requirement was

Met (Grand Mean = 2.84). In terms of competency, the highest mean (M = 3.33) was knowledge acquired which is interpreted as Strongly Agree or Highly Acquired followed by psychomotor skills (M = 2.96) which is interpreted as Agree or Acquired. However, attitude had the lowest mean (M = 2.24) which was interpreted as Moderately Agree or Moderately Acquired, showing lower expectations or observations in this competency domain comparatively.

The results of the Mann–Whitney U test on the difference between the acquired competencies of on-the-job (OJT) trainees and the competency demands of the Mechanical Technology industry are shown in Table 4. Statistically significant difference was found between the two groups (U = 62.00, Z = -6.327, $p < .001$). Hence null hypothesis was rejected as there is a significant difference between competency levels of OJT Trainees and competency demands identified by the industry respondents. Furthermore, the effect size was large (r = .645) suggesting that the difference found was not only statistically significant but also important in practice.

**Table 4. Competency Gaps between the Competencies of Trainees and the Requirements of the Industry**

| Competency | Trainees Mean | Industry Mean | Gap |
|---|---|---|---|
| Knowledge | 3.23 | 3.33 | -.10 |
| Psychomotor | 3.28 | 2.96 | +0.32 |
| Attitude | 3.46 | 2.24 | +1.22 |
| **Overall** | **3.32** | **2.84** | **+0.48** |

Table 4. Competency levels of Mechanical Technology OJT trainees and competency requirements of the industry Overall, trainees showed a higher competency level (M = 3.32) than the competency level reported by industry respondents (M = 2.84), resulting in an overall competency gap of 0.48. The closest gap was seen in knowledge (3.23 vs. 3.33) among the competency domains, suggesting that trainees' theoretical competencies were close to industry expectations. However, trainees scored higher in psychomotor (3.28 vs 2.96) and especially attitude (3.46 vs 2.24) where the biggest difference was noted. The results indicate that the trainees have competencies which are in line with the expectations of the industry, but there are inconsistencies in the specific areas of competencies.

## DISCUSSION

The study found that the OJT program is effective in developing the competencies needed in Mechanical Technology industry particularly psychomotor and attitude. It also further emphasizes the significance of workplace immersion in the development of technical skills and professional work behavior. However, knowledge domain received relatively lower scores, suggesting a constant review of curriculum to make it in line with the evolving industry practices and technological advancement. These findings are consistent with Competency-Based Education that emphasizes the alignment of learning outcomes with occupational standards [8] and the Human

Capital Theory that considers education and training as investments that improve productivity and employability [1]. Consistent with workplace learning theory, authentic industry experiences provide opportunities for students to integrate theoretical knowledge with practical application and professional competence [4; 2]. While the competency ratings were generally high, the significant differences between the ratings by the trainee and industry demonstrate the fact that the competency gap is still there, especially in the psychomotor and attitude domains. This means that graduates have enough technical knowledge, but employers focus on practical performance, adaptability, teamwork,
communication and professionalism in the workplace. Similar findings have been reported, as studies show that employability is dependent on the combination of technical and transferable skills gained through work-integrated learning [12; 5; 7]. The results also lend support to the objectives of the Philippine Qualifications Framework and the Commission on Higher Education (CHED) Student Internship Program of developing industry-relevant skills and workplace readiness through structured experiential learning [3;10]. The findings indicate the need to reinforce the industry-academe partnership with regular curriculum review, competency validation and more workplace learning opportunities. In the long term, collaboration between higher education institutions and industry is important to address competency shortages and enhance graduates' employability [6;11;9]. Such initiatives will guarantee the Mechanical Technology graduates are endowed with the competencies to meet the dynamic needs of the industry.

## CONCLUSIONS

The study identified the competency alignment of Mechanical Technology on-the-job (OJT) trainees and industry requirements. The findings show that the trainees generally acquired the expected competencies, especially in psychomotor skills and professional attitude which indicate the effectiveness of workplace immersion in developing technical and employability skills. However, the large gap between the trainees' competencies and the industry's expectations proves that there are competency gaps. This shows that there is a need for constant academic preparation to be in line with the real world. The results emphasize the significance of competency-based education and work-integrated learning in terms of ensuring that training outcomes are consistent with the occupational standards and expectations of the industry [13; 14]. It is recommended that higher education institutions work with industry partners to periodically review and improve Mechanical Technology curricula to ensure competencies are aligned, improve OJT implementation through structured assessment and feedback processes, and integrate emerging technologies and workplace competencies into training programs. Stakeholders in the industry are also being invited to participate in curriculum validation and competence assessment to ensure that graduates have the requisite technical and professional competencies. For future research, the analysis can be extended to other areas of competence (digital skills and Industry 4.0 readiness) with larger samples and in different industries**.**

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