

Artículo

Competencias y empleabilidad con sistemas duales: experiencia de El Salvador en la educación técnica¹

Rising competences and employability with dual system: experience of El Salvador in technical education

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Resumen

Este artículo desarrolla parte de la investigación titulada *Aumento de las competencias en educación técnica a través de la implementación de elementos del sistema dual en El Salvador en el campo de la mecatrónica*. Uno de los principales objetivos de la investigación es determinar si los estudiantes de la cohorte 2008-2009 que estudiaron bajo el sistema dual adquirieron mejores competencias profesionales para ser insertados en el proceso productivo que aquellos que estudiaron en el sistema tradicional. La investigación compara los estudiantes de la cohorte 2008-2010 en mecatrónica: uno en el sistema dual y otro en el sistema tradicional. La metodología aplicada fue una combinación de métodos cualitativos y cuantitativos con instrumentos como el cuestionario, la entrevista y las mediciones sobre de las competencias, tiempo para obtener un trabajo y condiciones salariales.

Palabras clave: sistema dual, empleabilidad, competencia, sistema alemán, educación salvadoreña.

Abstract:

This article develops a part of the research entitled *Rising competences in technical education by implementing dual system elements under El Salvador conditions in the field of Mechatronics*. One of the main purpose of the research was to determine if the students of cohort 2008-2010 who studied under the dual system acquired better professional competences to be inserted in the productive process than those who studied in a traditional system. The research compared students from cohort 2008-2010 in Mechatronics: one in dual and other in traditional system. The methodology applied was a combination of quantitative and qualitative method with questionnaires, interviews and measurements about competences, time to get a job and the salary conditions.

Keywords: Dual system, employability, competences, German system, El Salvador Education.

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1. Research for getting the academic title of PhD in Education from the Faculty of Education, Technische Universität Dresden, Germany

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1. Introduction

El Salvador context

Population and location

El Salvador is a tropical country located in Central America; it is the smallest country of Central America, with the greater population density. In 2009, the Household Survey and Multiple Purposes (EHPM) registered a total population of 6,150,953 inhabitants, distributed in the 21,040.79 km² in the national territory with a population density of 292 inhabitants per km². It was also reported that 59% of the population is between 15 and 29 years; these data reveals that the Salvadoran population is quite young (MINEC & DIGESTYC, 2010).

Economy

El Salvador's economy has been traditionally agricultural², but services and industry now employs a greater percent of the workforce and accounts for a much higher percentage of the gross domestic product. El Salvador's economy was adversely affected by its 12-year civil war during the decade of 80's (The Columbia Electronic Encyclopedia, 2007). El Salvador has achieved an average economic growth of 3.5% for the period 1990-2009. In 2009, gross domestic product (GDP) contracted by 3.5% and grew very moderately (1%) in 2010 (CEPAL, 2011). It also has a diversified economy, being reported in 2009 the contribution to GDP by major sectors as follows: manufacturing 24.1%, commerce 21%, infrastructure 14.7%, financial 12.3%, and others 8.5%.

It is a country with high levels of migration, currently about 3 million of Salvadorans are living abroad (Ministerio de Relaciones Exteriores, 2010), who contribute to the Salvadoran economy through remittances, which in 2010 accounted for 16.2 % of annual GDP (BCR, 2011). The deficit in trade of El Salvador is financed largely by remittances (CEPAL, 2011), which are mostly used for consumption in the household economies (Cáceres & Saca, 2006).

Based on the Global Competitiveness Index (WEF, 2010), El Salvador was in the rank 82, showing deterioration in competitiveness; from 2005 - 2006, El Salvador has dropped 19 positions in a constant sample of 119 countries in this index (INCAE, 2010). Among the strengths, the WEF's report highlights the efficiency of the property market and infrastructure development (roads, air and mobile communication), and certain macroeconomic conditions (in particular, a controlled inflation rate), the quality of local suppliers, and labor flexibility. However, the country is constrained by its limited capacity to innovate and weaknesses

2. About half of the land is used for either crops or pasturage. Corn is the chief subsistence crop, and rice, beans, oilseeds, and sorghum are also grown; coffee and sugar are the major commercial crops.

of public institutions and the quality of the education system. For investors and executives, crime, instability of the policies and access to financial resources are the main obstacles to doing business in the country (WEF, 2010).

Unemployment and young people

The poor development of the Salvadoran economy and the social problems have affected young people; there are problems with the delinquency, the phenomenon of “Maras” (gangs) and unemployment. People who are specially affected by this situation are young boys and girls between 14 and 24 years that approximately represent 20% of the population. In fact, El Salvador has been catalogued as one of the most violent country in the world with over 60 deaths per 100,000 populations; between 2004 and 2009, more people died violently according to the 2011 Global Burden of Armed Violence report (Geneva Declaration, 2011).

Recently studies from UNPD, remark that for young people, the main challenges and opportunities are given in terms of job creation and difficulties for insertion into the labor market is evidenced by high rates of underemployment and unemployment, 62% in 2009 for people between 18 to 24 years old (UNPD, 2010), that are significantly higher than those of any other age group. Most of the young people in vulnerable conditions come from families that have an average income of approximately US\$275.00 (GTZ, 2004). At present time, the minimum wage is US\$219.30 (Ministerio de Trabajo y Previsión Social, 2011).

Education and employability for young people

According to the world ranking, El Salvador is not in a good position in education and competitiveness. According the Global Competitiveness Index, the country has weaknesses in the quality of the education system (WEF, 2010). On the other hand, the same situation is presented for All Development Index (EDI) (UNESCO, 2010a), where in the year 2007 had the position 121 and 124 of 139 countries, in the evaluation of the education system and the quality of teaching in science and math, respectively.

Moreover, in a workshop developed in El Salvador in 2008 with the education stakeholders, there was an evaluation which included the perception and aspirations of the students and parents in terms of education. In this, parents expressed that their expectations are that education would enable their children pursue a career and have a decent job. But they considered that most graduates do not receive sufficient preparation to succeed in the workplace; they believed that the school curricula are not congruent with the demands of work. For their part, students between 13 and 19 years old expressed their expectations. They pointed out that they expect to graduate from high school, attend the university,

and have a decent job that allows them to improve their living conditions and their families (Comisión de Seguimiento Plan Nacional de Educación 2021 [Follow-up Commission for the 2021 National Plan of Education], 2008).

On the other hand, a recent survey conducted by USAID and GIZ in the 2011 about the private sector (enterprises) and the youth employment, where 21 enterprises and 5 people from business association were interviewed, has showed the demands to the educational system related to the formation process and the preparation of the students for the labor life. One datum, in the report is that the companies pointed the need to strengthen the strictness of study plan and align the curriculum of the education system (basic education, high school, higher and technical education) with the labor needs of the private sector and must, at a time, create mechanisms of approachment between the public institutions involved, training institutions and private enterprises. Also, pointed to the need, in order to begin exposing youth to real opportunities in the market through career counseling and internship opportunities (USAID & GIZ, 2011).

Similar situation has been presented by the American Chamber of El Salvador in some studies related to the needs from enterprises about the labor force, finding that enterprises demand from higher education institutions (HEI) to adapt their process of formation according the enterprise's needs (AMCHAM, 2011).

A recent World Bank study (World Bank, 2011) notes that the quantity and quality of employment in El Salvador have improved very little. This is because a significant deficiency of human capital, which is reflected in a poorly educated population, low levels of employability and vulnerable conditions. At the same time the Salvadoran economy has a very limited capacity to adopt and develop new technologies, which translates into a low capacity to generate quality jobs. Besides, the study remarks that the employment in El Salvador has a precarious labor panorama, especially for youth, which increased just 1%, which is insufficient to absorb new cohorts who entered the labor market.

Technical education

Technical education in El Salvador has been developed with the purpose of preparing youth for the labor life. Most of them are two years programs. Most of the technician in El Salvador are formed at ITCA³. It has the 27% of the total population registered in all technical education, according to the registries of the Ministry of Education for 2009 (MINED, 2010). This population means 4% of total student population in the higher education system of El Salvador.

3. ITCA is called the Academy for the purposes of this research. It is the Instituto Tecnológico Centroamericano (Central American Technical Institute of el Salvador)

In this system, students have to develop practicum in the enterprises for one and a half month (260 hours) like an internship at the end of the career. This practicum represents 7.4% percent of total of programmed hours average for its formation⁴. This system is called in this research "Traditional system". According to the Annual Report about Results 2007 and the Annual Report 2009 (ITCA, 2010), the employment rate for graduated technician in this system has been close to 80% for the last 10 years. The average salary could vary from US\$241.00 to US\$416.00 depending of the career and the region according the Annual Report (ITCA, 2010)⁵.

Dual system in technical education

Even though, the Traditional system has good level of employability compared to the unemployment rates for young people in El Salvador, as has been presented before; Dual system has been implemented in order to increase the employment rate and to improve the employability conditions. This system was introduced in the Mechatronics career in 2008, with the support from GTZ⁶, the German International Cooperation in El Salvador, under the FORTALECE program⁷.

Dual system combines the formation between the academy and the enterprise⁸, as a strategy to increase the competence level for the students in order to prepare them for the labor life, with the expectation to improve their labor conditions. This means more connection between the schools/academy and the companies. Actually, in both methods, the traditional and the new system, the academy keeps connection with enterprises, but this is more intensive in the new system, where students have to make enterprise practice for 10 months (1760 hours)⁹, and where they have tutors that help them with their apprenticeship according to the student guide developed with the curricula.

The problem

It is important to recognize that at this moment, in technological education this is the first experience with dual system in this country. The incorporation of the Dual System in Mechatronics and its impact in the level of competences developed

4. The average estimation of hours was taken from the presented Curricular Maps in Student Guide (ITCA, 2008e).
5. Better job opportunities are presented in the metropolitan area; this in the capital of El Salvador and the cities that are close to this region.

6. The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH brings together the long-standing expertise of the Deutscher Entwicklungsdienst (DED) gGmbH (German development service), the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH (German technical cooperation) and Inwent – Capacity Building International, Germany.

7. To reduce the unemployment problem, different programs have been implemented with the support of cooperating agencies; in this context the German International Cooperation, started in 2002 the program for the Strengthening of the Economy and Employment (FORTALECE in Spanish) with the aim of development and institutionalization of useful instruments for promoting systemic economic and employment at regional and national levels (El Salvador and Central America). One component of the program was the Youth Employment, aimed at increasing employability among young men and women aged 14 to 25 years.

8. More information about Dual system is developed in the next chapter. For ease of reading in this investigation the words "dual system", is used instead of "elements of the dual system", when referring to its simple implementation in El Salvador.

9. In the Traditional system are one and a half month (260 hours) like an internship at the end of the career.

by students and the incidence on the employability of technicians formed in the first cohort are the main purpose of this study. With the implementation of the New System is important to investigate its results comparing with traditional system, identifying if dual system has developed better competences in order to improve the employability level of students and deduce the consequences of its implementation under El Salvador conditions.

Aim, questions and hypotheses

The research *Rising competences in technical education by implementing dual system elements under El Salvador conditions in the field of Mechatronics* aims at determining if the students of cohort 2008-2010 who study under the dual system elements acquire better professional competences to be inserted in the productive process that those of the traditional system.

Questions

Related to the aim, the research was conducted in order to find the answers to this question: *Under which conditions does the Dual system contribute to raise the competences level and improve the employability on students in technical education?*

Hypothesis

In the empirical part, the hypothesis was defined as follow:

H1: Students of Cohort 2008 to 2010 that were formed under some elements of the Dual System (new system), have acquired better competences than students in the same cohort that were formed in the traditional system.

For methodological reasons and to facilitate the analysis and comprehension of data and results, this hypothesis has been sub divided in two sub hypotheses being established as follow:

Sub hypothesis H1.1: The students from cohort 2008 - 2010 that were formed in the new system (Dual system), got better competences than those of the same cohort who were formed in the traditional system.

Sub hypothesis H1.2: The students from cohort 2008 - 2010 that were formed in the new system (Dual system), got a job in less time and better salary in the first 6 months after the graduation, than those of the same cohort who were formed in the traditional system.

2. Empirical research in Mechatronics

Methodological approach

The research measures the results of implementing dual system (new system) in a group of students from Mechatronics cohort 2008 -2010, compared to the result of another group of students in traditional system in the same career and the same cohort.

To reach the objective of this research, the methodology applied was a combination of quantitative and qualitative methods with questionnaires, interviews¹⁰ and measurements of competences and analyzing time to get a job and the salary.

Population in the study

The population of this study was the students of the career of s of the Cohort 2008-2010 made up of 56 students, where 39 belonged to the dual system (70%) and 17 to the Traditional System (30%) respectively.

Methodological approach for Sub hypothesis H1.1

The hypothesis about the competencies (H1.1) was proved by evaluating the competences by grades, significant tasks, and observation of student's behavior. Besides the opinions about students development were taken from students and tutors.

Methodological approach for Sub hypothesis H1.2

To prove the Sub hypothesis H1.2, the methodological approach applied the statistical technique significant test for the two groups of students (T-student), and the analysis of level of placement and retention. The source of data was the dates when student got a formal contract and its salary. Two conditions of employability are measured: time to get job and salary.

Design

Because the type of research and the characteristics on how the groups were conformed, the design applied was the quasi experimental design. In this design the groups were not chosen at random but, through a process of admittance based on grades taken from the admission course and by the criterion of acceptance at the participating companies.

Due to this situation, it was necessary to verify that the initial conditions: academic, psychological and aptitudes were not significantly different between both groups.

10. Interviews and questionnaire results are not presented in this article.

These verification was made by considering (a) the results of the Aptitudes and Learning Test for Secondary Education Graduates (PAES), (b) the course notes for admission, and (c) the results of psychological testing. These analyses are shown further on.

The groups were divided as follows: (a) Experimental group (EG_Dual), with 39 students enrolled in the dual system; and (b) control group (CG_trad), with 17 students enrolled in the system.

The unit of analysis were students of Mechatronics enrolled in the cohort 2008–2010; and the treatment was the enterprise practical that student received in the company is the treatment by the experimental group; this approach allows the Dual Group an alternate formation period of 10 months between the academic institution and the company involved. This was a guided practice, that entails process and elaboration of student's binnacle, as well as records of evaluation, regarding the developed competences that include attitude aspects.

On the other hand, students from the Traditional group (Control group) stayed under a system where formation takes place merely at the academic institution. For this group of students practices occur at the end of their career for a period of one month and a half (6 weeks). It is relevant to note that such practice do not have any evaluation neither a formal supervision from the academic institution.

The Intervening Variable was the amount of guided practices received by students in the company determined by the study system. Variables were defined as follows: (a) Independent Variable. It was the study system, upon which students from each group are formed, it can take two values: Dual system or Traditional system. And (b) Dependent Variable. It was the level of competence acquired by students in the two different study systems and the employability conditions. The effect of independent variable, must be observed in this variable. It was established that the incidence of the study system (independent variable) in the competence level (independent variables), were measured by the knowledge, abilities and attitudes observed in students; and the time to get job and salary.

Aptitudes and learning initial conditions

Neither the experimental group nor the control group were made by random techniques; the main factor for the allocation of students to the Dual Group was the selection made by the representatives of the enterprises participating in the program. This situation led to identify that one of the factors that could affect the validity of the results was the selection of students. Because of this, it was necessary to verify that the initial conditions: academic, psychological and aptitudes were not significantly different between groups. To determine whether there is any

significant difference between both groups, the PAES results the course grades for admission and the results of psychological testing were considered. Each of this analysis is shown follows:

Aptitude and Learning Test for Secondary Education Graduates (PAES)

When students have completed their studies in high school, they must take the PAES. This test is provided by MINED¹¹, through which the competence of academic development of secondary education students is evaluated. The results are classified in three levels, as follow: (a) Basic, from 0.00 to 3.75; (b) intermediate, from 3.76 to 7.50; and (c) advanced, from 7.51 to 10.00. The national average for PAES in the year 2007 was 5.92 (MINED, 2008).

Students from cohort 2008-2010 in the career of Mechatronics, graduated from secondary school in 2007, they took the PAES in the same year¹², passing with an average higher than the national standard: 7.56 for Dual students and 6.71 for traditional group. This factor is a good academic indicator for students of this cohort. With the purpose of identifying whether the results of PAES marked significant differences in both groups (Dual system and Traditional system), the data were submitted to the statistics test T-Student, for independent samples. The hypothesis was:

$$H_0: \mu_{\text{PAES_Dual}} = \mu_{\text{PAES_Traditional}}$$
$$H_1: \mu_{\text{PAES_Dual}} \neq \mu_{\text{PAES_Traditional}}$$

The t test failed to reveal a statistically reliable difference between the mean of PAES, that students of Dual System have ($\mu_{\text{PAES_Dual}} = 7.5688$, $s = 1.25092$), and students of Traditional system have ($\mu_{\text{PAES_Traditional}} = 6.7154$, $s = 1.75064$), $t(17) = 1.599$, $p = 0.128$, $\alpha = 0.05$.

The null hypothesis H_0 was accepted, then there was not significant differences in the PAES between the two groups

$$H_0: \mu_{\text{PAES_Dual}} = \mu_{\text{PAES_Traditional}}$$

Admission grades

Both groups were submitted for the course of admission to go through a selection process in the companies. Those who were accepted into the companies came to form the dual group, while the others were admitted in the traditional group.

The mean value obtained for each group, during admission course was for the dual group of 7.4686, and 7.5688 for the traditional. Considering these results,

11. Ministry of Education of El Salvador.

12. Note: not all the students did PAES, because when some of them finished their high school, this test was not exist.

It was necessary to determine whether there was a significant difference in admission notes between the two groups. For this, the T-student test was applied to the independent samples in order to determine the following hypothesis:

$$H_0: \mu_{\text{course_admission_dual}} = \mu_{\text{course_admission_traditional}}$$

$$H_1: \mu_{\text{course_admission_dual}} \neq \mu_{\text{course_admission_traditional}}$$

The t-test failed to reveal a statistically reliable difference between the mean of Course admission, that students of Dual System have ($\mu_{\text{course_admission_Dual}} = 7.4686$, $s = 1.08671$), and students of Traditional system have ($\mu_{\text{course_admission_Traditional}} = 7.5688$, $s = 0.95965$), $t(52) = 0.326$, $p = 0.746$, $\alpha = 0.05$.

H_0 was accepted, then there was not significant differences in course admission between the two groups, when they started their studies

$$H_0: \mu_{\text{admission_course_dual}} = \mu_{\text{admission_course_traditional}}$$

Psychological test

Students in both groups were evaluated with a parametric test, in the areas of personality, values and character in order to know if there was a significant difference in psychological aspects that could give advantages to one group from the other in the learning process. This was done using the Gordon Personal Profile–Inventory (GPP-I) and Gordon´s Survey of Personal Values (SPV)¹³, in order to establish the level of psychological functioning at the time to start the career. Tests were applied, supervised and controlled by Psychologists¹⁴. Students were organized in three groups, where group A (19 students) and B (19 students) belonged to Dual System, and group C was students in Traditional System (18 students¹⁵).

Test results

- Gordon Personal Profile – Inventory (GPP-I)

In relation to the PPG-IPG test, group A (Dual) received a global score of 361 and an average of 19 points per subject, while group B (Dual) received an overall score of 396, giving an average of 21 points, meanwhile the group C, had values of 365 points overall and an average of 20. As can be seen, there is a very slight

13. Leonard V. Gordon is the author of the tests.

14. Hada de Escalante and Carlos Mario Pacheco administered tests. They are professionals in Psychology in El Salvador (Escalante & Pacheco, 2008).

15. In 2008, were 20 students enrolled in traditional group, 18 of them did the psychological test. In 2010, there were only 17 students in this group.

advantage on the average score of the group B on the other two groups, 2-point advantage in relation to group A and a point with respect to C.

- Gordon´s Survey of Personal Values (SPV)

With regard to Survey of Personal Values (SPV), although there are differences in scores by Range, it disappears when comparing the averages of the tests because the three groups had an average score of twelve (12).

In conclusion, by inspection of the results it can say, that there are no differences, in psychological characterization of subjects that form the different groups¹⁶. This means that when starting the training process the groups are homogeneous.

The above is convenient because if there are any changes in further evaluations it will mean that It is probably the result of the educational treatment to which each group has been exposed.

Although, neither the experimental groups nor the control groups was formed by random techniques; analyzing the initial condition related to PAES, Admission Course and psychological test, it is determined that:

Students in both groups started with similar conditions related with their knowledge (results in PAES and course of admission), and psychological level.

Sub hypothesis (H1.1) about higher competences: Results and valuation

Competences by grades, significant task and observation of behavior

With Coefficient of Unit of Merit (GPA) as a global grade of competences

The GPA has used in the evaluation system in higher education, which is used to measure the academic performance of learners¹⁷. The following data were the final GPA of students at end of 2010, period when was supposed to finish the career. The analysis is done from considering the studio system, where seeks to determine whether there were significant difference in the results of the GPA

16. Conclusion for psychological test was made for Hada de Escalante and Carlos Mario Pacheco who are professional in Psychology in El Salvador (Escalante & Pacheco, 2008).

17. The definition method of calculation, is laid down in Article 7 of the Act on Higher Education (MINED, 2004), which states that the unit of Merit is the final grade for each subject, multiplied by their valuation units. While the Coefficient of Units of Merit is the quotient of the total units of merit earned by the total of credit units of courses taken and passed.

among students of the Dual System and the Traditional. The null hypothesis and alternative were:

$$H_0: \mu_{\text{GPA_dual}} = \mu_{\text{GPA_traditional}}$$

$$H_1: \mu_{\text{GPA_dual}} \neq \mu_{\text{GPA_traditional}}$$

The test was applied for testing differences between means by T-Student for independent samples¹⁸. The mean value obtained for the Study System and other statistical data as the standard deviation and standard error of the mean, is shown in Table 1, and T-Student results are in Table 2:

Table 1. Statistics for GPA - Hypothesis H1.1

Group Statistics					
	Study System	N	Mean	Std. Deviation	Std. Error Mean
GPA	Dual	39	8.274	.4128	.0661
	Traditional	17	8.006	.6329	.1535

Table 2. t-Test for GPA

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper	
GPA	Equal variances assumed	2.054	.158	1.891	54	.064	.2685	.1420	-.0161	.5531
	Equal variances not assumed			1.606	22.162	.122	.2685	.1671	-.0780	.6149

The columns labeled "Levene's Test for Equality of Variances", tells whether an assumption of the t-test has been met. The t-test assumes that the variability

18. Results from the database "Final Student Profile.sav" processed by the software: Statistical Package for the Social Sciences (SPSS).

of each group is approximately equal. Then, Levene test Sig. = 0.158 > 0.05. Because the value (0.158) is greater than α level for the test (.05), then the null hypothesis is accepted where the variability of the two groups is equal, implying that the variances are equal. Then, T-Student for equal variances: Sig. (p) = 0.064 > 0.05.

The t test failed to reveal a statistically reliable difference between the mean of GPA, that students of Dual System have ($\mu_{\text{CUM_Dual}} = 8.274$, $s = 0.4128$), and students of Traditional system have ($\mu_{\text{CUM_Traditional}} = 8.006$, $s = 0.6329$), $t(54) = 1.891$, $p = 0.064$, $\alpha = 0.05$.

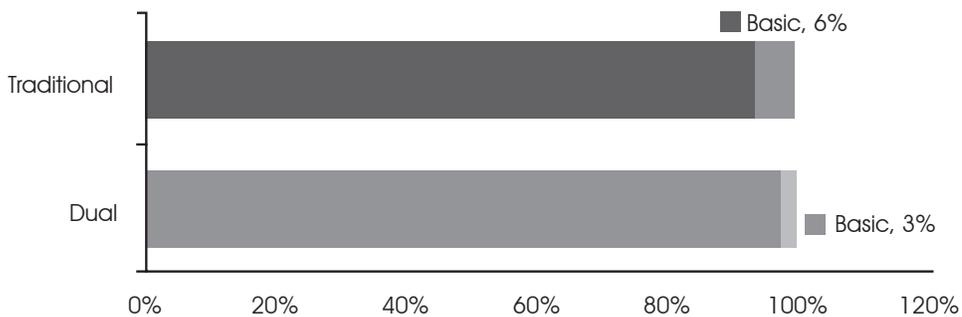
H_0 is accepted, then there is not significant differences between both groups related to the final grades that were measured by GPA

$H_0: \mu_{\text{GPA_dual}} = \mu_{\text{GPA_traditional}}$

Level of competence

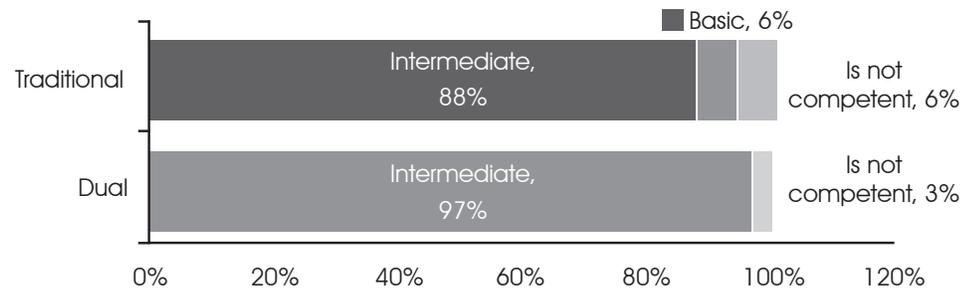
For this research in order to compare how both systems are different from the point of view of competence level, the following classification of grades have been used: (a) Advanced, from 9.1 to 10.0; (b) Intermediate, from 7.6 to 9.0; (c) Basic from 6.9 to 7.5; and (d) Is not competent. Less than 6.8. Analyzing the data by level of competences in the first year of cohort 2008-2010, almost all students got the intermediate level; 94% for traditional and 97% for dual system, showing little difference of 3 point up in dual system (See Graph 1).

Graph 1. Level of competence in year 2008



At the end of their studies in the year 2010, the gap grow up with a slight difference of 9 point in favor of in the group of the dual system, because one student got a step down from intermediate to not competent level; 88% for traditional and 97% for dual system, showing a little difference of 9 point up in dual system (See Graph 2).

Graph 2. Level of competences in year 2010

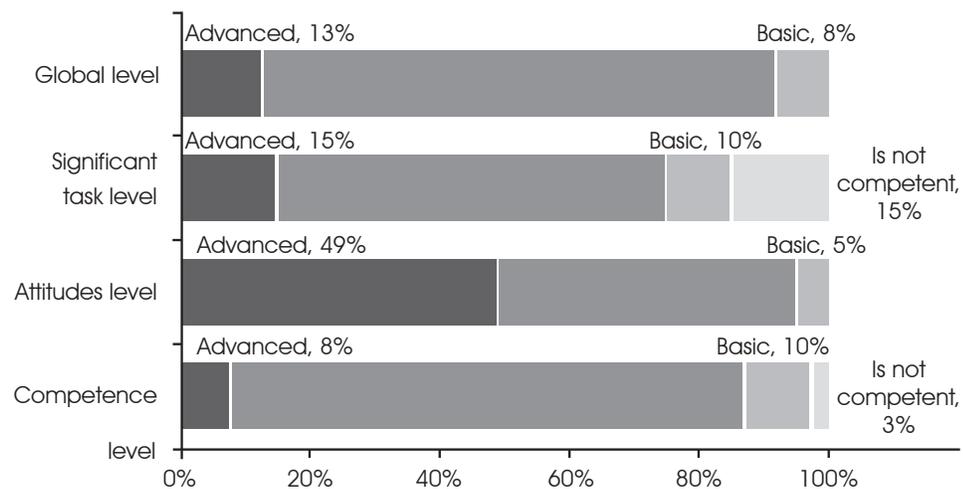


Level of competences according enterprise practice (Only for Dual students)

The measurement of skills was more complete for students in the dual system because in addition to the evaluations obtained at the Academy, they were evaluated in the company, using the binnacle¹⁹ as assessment instrument, where it was considered: Competences (skills and knowledge), attitudes and the significant task (skills). All these evaluations were part of level of global competences²⁰ from enterprise.

Assessments made by the tutors reflect better results than those in the academy, in the sense that students have achieved the advanced level of competences (See Graph 3). One of the more valued factors is the student's attitude shown while the training was being developed the company where 49% achieved the advanced level and 46% the intermediate level, which together make up 95% of students achieving at these levels.

Graph 3. Enterprise competences evaluation



19. The Binnacle instrument used by tutors at enterprises.

20. The global competence grade was calculated considering the 40% of average of competences grades (knowledge and skills), the 30% of average of evaluations related with attitudes and the 30% assigned for significant task (skills).

Moreover, the area with the lowest result was for the evaluation to the significant tasks, where they reached the advanced and intermediate levels to 75% of the students.

Job in less time and better salary (Sub hypothesis H1.2)

Returning to the understanding of competences, according OECD, where "Key competences represent a transferable, multifunctional package of knowledge, skills and attitudes that all individuals need for personal fulfillment and development, inclusion and employment. These should have been developed by the end of compulsory school or training, and should act as a foundation for further learning as part of Lifelong Learning"²¹. It is important to evaluate the employability as a result of the formation process of the new study system. For that the empirical research included to prove, if students in Dual system (the new system) have had better opportunities of employment than students in traditional system. The measurements were made by comparing the time to be hired and the salary level.

The population of the cohort 2008 - 2010 was 56 students, from which the 75% finished their studies as the study plan demanded. In Dual system from 39 students, 31 (79% of dual population) were graduated on time, meanwhile in traditional, from 17, 11 students (65% from traditional population) finished on time.

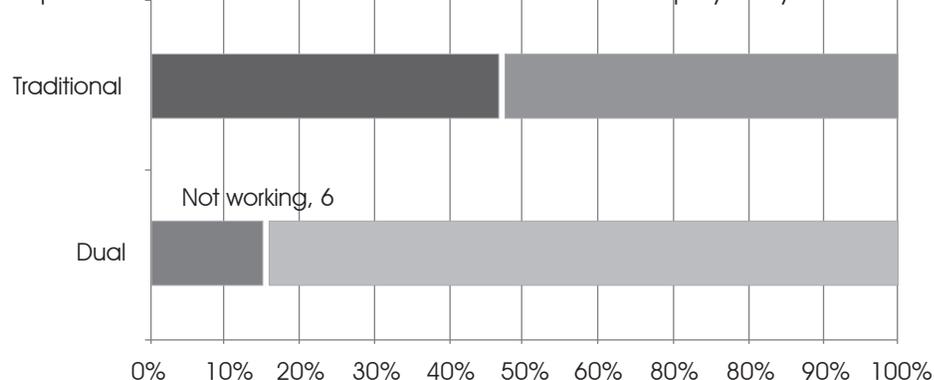
The foregoing mean is that dual system has better performance than traditional in terms of academic efficiency as measured by the time it takes to complete the studies. Considering the graduation the end of the studies, this was the starting point to measure the time that took the student to be employed by an enterprise and its correspondent salary. It is important to clarify that, in addition to the graduates, some of the undergraduates, were employed, so for purposes of this investigation are considered both.

Job in less time

Taking into consideration graduate and not graduate on time students, six months after the graduation, 85% of dual group got a job, while in traditional group only 53% had employment (See Graph 4).

21. European Commission (2003b). Implementation of "Education and Training 2010" work program, Working group on Basic skills, entrepreneurship and foreign languages.

Graph 4. Mechatronics cohort 2008 – 2010 - Level of employability



Analyzing inside the data, most of the graduates' students and some not graduate, with an employ in the first month after graduation: 67% for Dual system, and 41% for Traditional. In case of Dual group, the Level of Retained was 41%; meaning the proportion of persons who got a job immediately that they have finished their studies, which were hired in the same enterprise where practice was done. After six month, the gap into the two groups in relation to the time to get a job grow up, where dual group's employability was 85%, while traditional had 53% (See Table 3).

Table 3. Mechatronics cohort 2008 – 2010 - Time to get a job

Time to get Job since graduation (Include graduate and not graduate on time students)				
Time	Study System			
	Dual		Traditional	
	Count	The cumulative percentage	Count	Cumulative percentage
Immediately after graduation	16	41%	0	0%
One month after	10	67%	7	41%
Two months after	1	69%	0	41%
Three months after	1	72%	1	47%
Four months after	0	72%	0	47%
Five months after	1	74%	1	53%
Six months after	4	85%	0	53%
Without a job	6	100%	8	100%
Total	39		17	

The Level of retained (41%) was close to the expectation to be hired that the students have (54%). In conclusion:

According the placement test and the level of retention, the students from cohort 2008 - 2010 that were formed in the new system (Dual system), got job in less time in the first 6 months after the graduation, than those of the same cohort who were formed in the traditional system.

Better salary

Better salary in the other factor to prove is the salary conditions for students from cohort 2008 – 2010 who had been employed. The hypothesis declaration is as follow:

$$H_0: \mu_{\text{Salary_dual}} = \mu_{\text{Salary_traditional}}$$

$$H_1: \mu_{\text{Salary_dual}} \neq \mu_{\text{Salary_traditional}}$$

The test is applied for testing differences between means, by the T-Student for independent samples²² The mean value obtained for the Study System and other statistical data as the standard deviation and standard error of the mean, are shown in Table 4, and the results of applying T-Student are in Table 5.

Table 4. Statistics of Mechatronic student salary from cohort 2008 - 2010

Group Statistics					
	Study System	N	Mean	Std. Deviation	Std. error Mean
Salary	Dual ²³	32	476.31	158.00	27.93
	Traditional	9	357.78	115.30	38.43

22. Results from the database "Final Student Profile.sav" processed by the software: Statistical Package for the Social Sciences (SPSS).

23. Even though, 33 persons were working, only 32 were processed, because one of the data was not available because the technician was out of the country.

Table 5. t-Test for Salary

Independent Samples Test										
F		Levene's Test for Equality of Variances		t-test for Equality of Means						
		Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
								Lower	Upper	
Salary	Equal variances assumed	1.102	.300	2.091	.39	.043	118.5347	56.6858	3.8768	233.1926
	Equal variances not assumed			2.495	17.427	.023	118.5347	47.5114	18.4815	218.5879

The columns labeled "Levene's Test for Equality of Variances", tell it whether an assumption of the t-test has been met. The t-test assumes that the variability of each group is approximately equal. Then Levene test: Sig. = 0.300 > 0.05. Because the value (0.300) is greater than α level for the test (.05), then the null hypothesis is accepted where the variability of the two groups is equal, implying that the variances are equal. Then, T-Student for equal variances: Sig. (p) = 0.043 < 0.05.

The t test for independent sample reveal a statistically reliable difference between the mean of salary, that students of Dual System have ($\mu_{\text{Salary_Dual}} = 476.31$, $s = 158.00$), and students of Traditional system have ($\mu_{\text{Salary_Traditional}} = 357.78$, $s = 115.30$), $t(39) = 2.091$, $p = 0.043$, $\alpha = 0.05$. In conclusion:

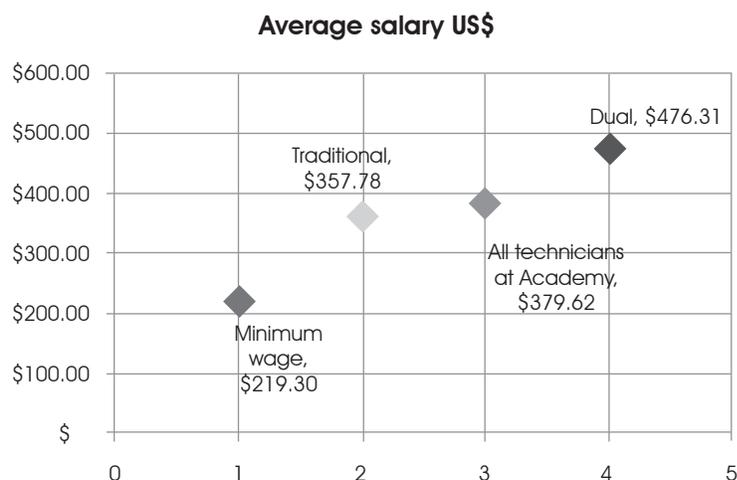
H_0 is rejected, then there is a significant differences between both group related with the salary, where dual group ($\mu_{\text{Salary_Dual}} = \text{US}\476.31), has gotten better salary than traditional group ($\mu_{\text{Salary_Traditional}} = \text{US}\357.78).

$$H_0: \mu_{\text{Salary_dual}} \neq \mu_{\text{Salary_traditional}}$$

It is also important as a reference point that minimum wage for industry since May 2011 is US\$210.30 in El Salvador (Ministerio de Trabajo y Previsión Social, 2011). Moreover, the average salary of all technical graduates at the same time of Mechatronics groups, in this educational institution for the year 2010 was

US\$379.62, and the percentage of placement of 73.56%²⁴. The foregoing, shows that the Dual group's students, had better results at the placement Percentage (85%) relative to the placement rate of graduates of all technical careers of the Academy (73.56%); in wage levels also exceeded the overall average for all technical graduates in the year 2010 (See Graph 5).

Graph 5. Average salary



Conclusions

As has been identified by World Bank (2011), the main challenges and policy priorities in the short and medium term to improve the employment situation of the Salvadoran population, where among other things, recommended implementing a comprehensive reform of education system where is necessary to assess their relevance for the labor market, modernizing curricula, teaching methods and learning assessment according to international standards and diversify the range of interdisciplinary studies.

According to the results of this empirical study, Dual system could be a strategic to attend part of the challenges of the employability situation for youth and to improve the technical educational system. This main conclusion is developed as follows by the association to the aim of the research, giving answer for two scientific questions presented before.

Better competences for students in Dual system

To determine if the students of cohort 2008 - 2010 who study under using dual system elements acquire better professional competences to be inserted in the

24. The placement rate and the average salary, was calculated in the first 6 months after the graduation, and the data was in the Annual Report for the year 2010; it included the graduated from all technical careers. Annual Report of ITCA (ITCA, 2011b).

productive process than those of the traditional system was the aim. The scientific question was: Under which conditions does the Dual system contribute to raise the competences level and improve the employability on students in technical education?

The investigation to find the answer to these question were based in the hypothesis H1, where the aim was to prove if students of Cohort 2008 to 2010 that were formed under some elements of the Dual System and have acquired better competences than students in the same cohort that were formed in the traditional system. This was proved by two sub hypothesis related to prove the level of competences (H1.1) and the other about the employability conditions that include getting a job in less time and better salary conditions (H1.2). The test of the sub hypothesis showed the following results comparing the Dual group with traditional group: a) There was no difference in the level of competences; b) the Dual group got job in less time; and c) the Dual group got better salary (See Table 6).

Table 6. Summary result for Hypothesis H1

Hypothesis	Dual group	Traditional group
Competences level	Same	Same
Time to get job	Less time	More time
Better salary	Higher salary	Lowest salary

Taking in consideration the three factors measured, Dual system has contributed to maintain a good level of competence (97% in intermediate level) as has been tested with sub hypothesis H1.1 with the dual group. Besides, students in Dual system had better job conditions with good rate of placement time (85% in the first six months and 41% retention level) and better salary comparing with the traditional group and with the technician from other careers who have graduated at the same time. The test of this sub hypothesis showed that there is a significant difference in the salaries between dual group and traditional group, having dual group better salaries. Then, the main aim was to find out if students of cohort 2008 - 2010 who study under using dual system elements acquire better professional competences to be inserted in the productive process that those of the traditional system.

Taking only the grades at the Academy there were not significant differences between both group. In these grades were reflected the measurement competences method of the Academy. Here is important to remember about difference between qualifications and competences. Competences are developed in controlled situation; it certifies that the person knows and can do

something; but this is not guarantee that this person will be successful in non-controlled situation, resolving problem in the real life.

So, it is possible to assure that both groups acquire the same level of professional qualifications, because the evaluation by final grades were under controlled situations. But, considering that Dual group has developed its formation taking contact with the real world, exposed to solve real problems, and according the interviews (opinions from students and tutors), they got a very good level of competences. Besides, The results about job opportunities (time to get a job and salary conditions) were better for Dual group.

Considering all these facts, it is possible to affirm that students of cohort 2008 - 2010 who studied under dual system has acquired better professional competences to be inserted in the productive process that those of the traditional system

In conclusion:

Dual system is a possibility to have a better quality in technical higher education, raising the competences level and improving the employability of the students, preparing them for the labor life.

Besides, in order to have better measurements at Academy about students' competences level, where it is necessary to reevaluate the actual measurement system including a better evaluation for competences developed in non-controlled situation in the real work life. It has to consider²⁵ (a) personal competences; (b) Activity and implementation-oriented competences; (c) technical and methodological competences; and (d) social and communicative competences.

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25. Competences measurement is addressed in chapter II.

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