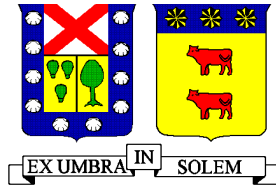


UNIVERSIDAD TECNICA FEDERICO SANTA MARIA
DEPARTAMENTO DE OBRAS CIVILES
VALPARAISO – CHILE



Análisis del sistema educacional para los trabajadores de la
construcción Chilenos basado en un análisis comparativo de los sistemas actuales en
Alemania y Chile

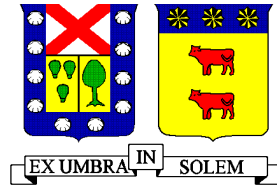
Sebastián Andrés Frontanilla Macchiavello

Memoria para optar al título de
Ingeniero Civil

Profesor Guía
Leonhard E. Bernold

Marzo de 2018

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Como requisito parcial para optar al título de
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Für meine Frau, danke für alles

RESUMEN

Una de las áreas más importantes donde se desempeñan los ingenieros civiles en Chile es la construcción. En ella existe un problema bien conocido que tiene efectos negativos drásticos y que es la falta de programas de formación para los trabajadores de la construcción.

En Chile, el número de trabajadores de la construcción que no han recibido ningún tipo de capacitación para ejercer sus tareas diarias, de acuerdo a la Cámara Chilena de la Construcción, alcanza el 64,4%.

El número promedio de accidentes laborales fatales en Chile en el periodo 2007-2013 solo en el área de la construcción alcanzó las 95,4 muertes por año. Este número representa el 20% de los accidentes laborales fatales totales en el país. Esta cifra alarmante puede ser reducida capacitando a la fuerza laboral.

El objetivo de esta tesis es investigar el sistema de formación para los profesionales de la construcción en Alemania como base para proponer un concepto basado en las necesidades que requiera la situación actual de Chile. Particularmente se compararán la carrera técnico profesional del nivel medio en el área de la construcción en Chile con la formación que reciben los trabajadores de la construcción en Alemania bajo el sistema de educación dual. Esta modalidad consta básicamente de una formación donde los aprendices dividen su tiempo entre la escuela y una compañía, mezclando conocimiento teórico y práctico a lo largo de su formación.

Se comienza con un análisis del sistema actual para la formación de técnicos del nivel medio en Chile, particularmente el sistema de formación dual implementado en 1991 tras un convenio de cooperación entre los gobiernos chileno y alemán.

La segunda fase está basada en el estudio de la efectividad que posee el sistema alemán. La clave será entender la malla curricular, los métodos de aprendizaje, los roles y responsabilidades del gobierno, las empresas participantes y el aprendiz.

Se tendrá especial cuidado en tomar en cuenta las diferencias sociales, culturales y económicas de ambos países al momento de proponer modificaciones, estas estarán relacionadas con los siguientes puntos: (1) la estructura de colaboración, (2) el plan de estudios y (3) el método de evaluación. Las modificaciones propuestas tienen el fin de brindar homogeneidad y mejorar la calidad de los graduados a nivel nacional.

También se buscará conocer de mejor manera la realidad actual del sistema de Educación Dual en Chile y la actitud de los participantes (liceos y compañías) mediante una encuesta. Las estadísticas resultantes ayudarán a elaborar un diagnóstico de la situación actual. De este modo, se podrán evidenciar posibles problemas en el actual sistema.

ABSTRACT

One of the most important areas in Chile where civil engineers are needed is the construction area. This area is lacking training programs for the construction workers, which has drastic negative effects, such as poor quality and a high rate of accidents.

According to the *Cámara Chilena de la Construcción* (Chilean Chamber of Construction), 64.4% of the Chilean construction workers haven't received any form of professional training to perform their daily tasks on the construction sites.

It is therefore not surprising that the average of fatal occupational accidents in Chile between 2007 and 2013 is 95.4 deaths per year in construction alone. This number represents 20% of the fatal industrial accidents in the entire country. Experiences from other countries show that a professional training program would drastically improve work quality and reduce the accident rate.

One country that is believed to have an excellent professional training concept is Germany. The objective of this thesis is to study the present training system for the professional construction workers in Germany as a base to design a comprehensive program that meets the needs of the construction industry while considering the Chilean reality and its history.

This work will present a comparison of Chile's *carrera técnico profesional del nivel medio* in the construction area in Chile with Germany's Dual Educational System. A significant segment of work is dedicated to study and model this system which consists of a training program where the trainees divide their time between working at a company and attending classes at school. The thesis work stresses the value of developing theoretical knowledge and practical skills in a synergistic manner. Special focus will be put on the social, cultural and economic differences in both countries that might have an impact on how the developed modifications can be implemented.

In addition, the pedagogical methods employed the roles and the responsibilities of the government, the participating companies and the trainees are described.

Modifications will be developed in the following areas: (1) the structure of the collaboration, (2) the Curriculum and (3) the evaluation methods. The modifications have the goal to achieve homogeneity and an overall higher qualified workforce on national level.

Finally, by the use of a survey we will try to better understand the reality of the current system of Dual Education in Chile and the response of the participants in both schools and companies to the idea of a Dual Educational System.

The statistics will help to elaborate and understand the current situation to show possible problems in the current system.

Index

Table of Contents

RESUMEN.....	I
ABSTRACT.....	IV
INDEX.....	V
TABLE OF CONTENTS.....	V
LIST OF FIGURES.....	VI
LIST OF TABLES	VII
1. INTRODUCTION	1
2. REVIEW OF EDUCATIONAL JOB TRAINING SYSTEMS.....	4
2.1. STATE OF THE ART OF THE MOST EFFECTIVE JOB TRAINING METHODS.....	4
2.2. EDUCATIONAL SITUATIONS IN CHILE AND GERMANY	7
2.2.1. GENERAL BACKGROUND	7
2.2.2. WHY IS TRAINING SO RELEVANT FOR THE CONSTRUCTION SECTOR?	8
2.2.3. STRUCTURE OF CHILE'S EDUCATIONAL SYSTEM AND THE VOCATIONAL TRAINING FOR CONSTRUCTION	14
2.2.4. STRUCTURE OF GERMANY'S EDUCATIONAL SYSTEM AND THE EFFECTIVENESS OF THE DUAL EDUCATIONAL SYSTEM IN GERMANY	16
2.3. STRUCTURE OF THE DUAL EDUCATION SYSTEM IN CHILE.....	20
2.3.1. THE CURRICULUM.....	21
2.3.2. THE PERFORMANCE PLAN DEFINING LEARNING OBJECTIVES.....	22
2.4. STRUCTURE OF GERMANY'S DUAL EDUCATIONAL SYSTEM.....	26
2.4.1. THE DUAL EDUCATION IN BUILDING CONSTRUCTION	28
2.5. FINANCING OF THE DUAL SYSTEMS.....	30
2.5.1. FINANCING OF THE EDUCATION IN CHILE.....	30
2.5.2. FINANCING OF THE DUAL EDUCATION IN GERMANY	31
2.6. MONITORING AND EVALUATION OF STUDENT PERFORMANCE.....	33
2.6.1. MONITORING AND EVALUATION OF THE STUDENTS UNDER THE DUAL SYSTEM IN CHILE	33
2.6.2. MONITORING AND EVALUATIONS OF THE STUDENTS UNDER THE DUAL SYSTEM IN GERMANY ..	35
2.7. MODEL OF PARTICIPANTS IN THE DUAL SYSTEM IN CHILE	37
2.7.1. THE ACTUAL CURRICULUM	38
2.7.2. ASSESSMENT METHOD OF STUDENT KNOWLEDGE AND SKILLS.....	39
2.7.3. COMMUNICATION BETWEEN THE INVOLVED ENTITIES	39
3. A DEVELOPED CHILEAN MODEL FOR A DUAL SYSTEM EDUCATION	41
3.1. IDENTITY OF THE VOCATIONAL EDUCATION.....	41
3.1.1. GERMANY'S LIFELONG LEARNING POLICY	41
3.1.2. TECHNICAL CAREERS VERSUS UNIVERSITY CAREERS IN CHILE.....	43
3.2. MODIFICATIONS OF THE CHILEAN DUAL SYSTEM OF EDUCATION BASED ON THE GERMAN MODEL.....	47

3.2.1. THE CORNERSTONE FOR THE DUAL MODEL	48
3.2.2. THE CURRICULUMS AND THE ADDITION OF SEMINARIES.....	49
3.2.3. A MODEL FOR A COMPANY'S LEAD CURRICULUM	50
3.2.3.1. Major in building constructions.....	51
3.2.3.2. Major in completions in construction	52
3.2.4. EVALUATION	53
4. ANALYSIS OF THE CURRENT SITUATION OF THE DUAL SYSTEM IN CHILE AND PERSPECTIVE FOR THE FUTURE	56
CONCLUSIONS	61
REFERENCES.....	64
ANNEXES.....	68
ANNEX A - CURRICULUM FOR THE TECHNICAL CAREERS IN CHILE WITH MAJORS IN BUILDING CONSTRUCTOR AND COMPLETIONS IN CONSTRUCTION	68
ANNEX B – COMPANY'S CURRICULUM, FIRST YEAR	70
ANNEX C – COMPANY'S CURRICULUM FOR THE MAJOR IN BUILDING CONSTRUCTION, SECOND YEAR..	72
ANNEX D – COMPANY'S CURRICULUM FOR THE MAJOR IN COMPLETIONS IN CONSTRUCTION, SECOND YEAR	73
ANNEX E – SURVEY 1 (FOR TECHNICAL SCHOOLS).....	74
ANNEX F – ANSWERS SURVEY 1 (TECHNICAL SCHOOLS)	79
ANNEX G – SURVEY 2 (FOR COMPANIES)	86
ANNEX H - ANSWERS SURVEY 2 (COMPANIES)	91

List of Figures

Figure 1 - Number of Fatal Accidents in Chile per Year.....	2
Figure 2 – Percentage of U.S. Workers with Some Postsecondary Education	10
Figure 3 - Average Turnover Rate of counties member of the Organization for Economic Co-operation and Development.....	12
Figure 4 – What are the business impacts of having skills gap?	13
Figure 5 – Structure of Chile's Educational System.....	15
Figure 7 - Educational Background of the new trainees in 2011	18
Figure 8 – Background education of the workforce in Germany.....	19
Figure 9 - Rotation Plan	22
Figure 10 - <i>Liceos</i> under the Dual formation according to their financial type.....	23
Figure 11 - Percentage of training schools per region that have Dual Education.....	25
Figure 12 - Distribution of registered students according to the economic sector (2012)	25
Figure 13 - Structure of the Germany Dual System	27
Figure 14 - Evaluation Form of behavior and personal development	34
Figure 15 - Example of a page of the Notebook Report	35
Figure 16 - Model of the Chilean Dual System of Vocational Education.....	37

Figure 17 – Rate of average scores over 475 points in the PSU test between 2006 and 2008.....	44
Figure 18 – Modified model of the Dual System of Vocational Education.....	48
Figure 21 – Answers of the Technical School's staff to question 6: Order the following factors in accordance with its implication in labor accidents. 1 implies very often and 5 not often.....	57
Figure 26 - <i>Accidentes laborales fatales en Chile</i>	86

List of Tables

Table 1 – Personnel Factors that cause accidents at work.....	1
Table 2 - Technical-Professionals majors in the construction area	15
Table 3 – Specialties in the building construction area (Germany)	28
Table 4 – Germany's Curriculum for Building Construction Workers, first year	28
Table 5 - Reasons why German Companies take part in the Dual Educational System	32
Table 6 - Survey to the graduates from the Dual System.....	43
Table 7 – Company's Curriculum, First Year	51
Table 8 - Modules of the major in building construction, second year.....	52
Table 9 - Company's Curriculum for the Major in building construction, second year	52
Table 10 –Modules of the major in completions in construction, second year	53
Table 11 - Company's Curriculum for the Major in Completions in Construction, Second Year.....	53
Table 12 – Examination areas for the Technical career in construction with major in building constructions.....	54
Table 13 – Examination areas for the Technical career in construction with major in completions in construction	55

1. Introduction

According to studies of the *Cámara Chilena de la Construcción (CCHC)*¹, 64,4% of the workers in the construction industry in Chile have not received any type of training for the tasks they perform daily. The lack of skills and job related expertise results in low quality of the final product and poor performance during the construction process.

Today, Chilean construction companies are trying to use more technology in their processes to keep up with the competition and the constant economic growth of the country. Furthermore, the lack of continuous training opportunities to improve the basic working skills inhibits the improvements in the future. This can eventually cause the companies in Chile to slowly lose competitiveness against other local or foreign companies that are willing to invest in professional training to implement more efficient construction processes.²

According to the SENCE (*Servicio Nacional de Capacitación y Empleo*), the Chilean construction area has the lowest rate of trained personnel in the country with just 23%³. Companies in Chile avoid investing in extensive trainings of their workers because the workers often switch to different companies after a project is completed. Due to this fact, many companies prefer not to directly hire construction workers, leaving the responsibility to train the staff to the subcontracting company.

While efficiency has to be taken into consideration in order to provide a good training for construction laborers, safety is certainly the most critical factor. According to the *Dirección del Trabajo* (Chilean Department of Labor), the main causes of accidents are related to personnel and work factors. Table 1 presents the five most common personal factors that cause accidents at work.

Table 1 – Personnel Factors that cause accidents at work

Factors
1. Lack of knowledge or ability to do the work entrusted
2. Lack of personal motivation or wrong motivation
3. To try to save time and energy
4. To get the attention of the rest of the workers, to express hostilities
5. The existence of problems or physical/mental disabilities

¹ FUENZALIDA Gatica, Gisela. Instituto de Capacitación para el Obrero de la Construcción y su entorno familiar y comunitario. Memoria (Arquitecto). Santiago. Universidad de Chile, Facultad de Arquitectura y Urbanismo, Escuela de Arquitectura, 2010. p7.

² GHIO Castillo, Virgilio A. y BASCUÑAN Walker, Roberto. Innovación Tecnológica en la Construcción Ahora es cuando. [en línea] Revista ingeniería de Construcción. 1995. No 14.
<<http://www.ricuc.cl/index.php/ric/article/viewFile/360/302>> [consulta: enero 2016]

³ OLIVERA, María y MATURANA, Víctor. Estudio: Caracterización del impacto de la capacitación a partir de los datos de la encuesta CASEN 2000 y 2003. [En línea] SENCE. Mayo 2005.
<http://www.sence.cl/601/articles-3068_archivo_002.pdf> [consulta: junio 2016]

The first three factors are related with a wrong or non-existing training. Figure 1 shows the number of fatal accidents in Chile per year between 2007 and 2013. The average percentage of fatal accidents that take place just in the construction area is 20% from a total of almost 500 deaths, which is equivalent to 95,4 deaths per year.

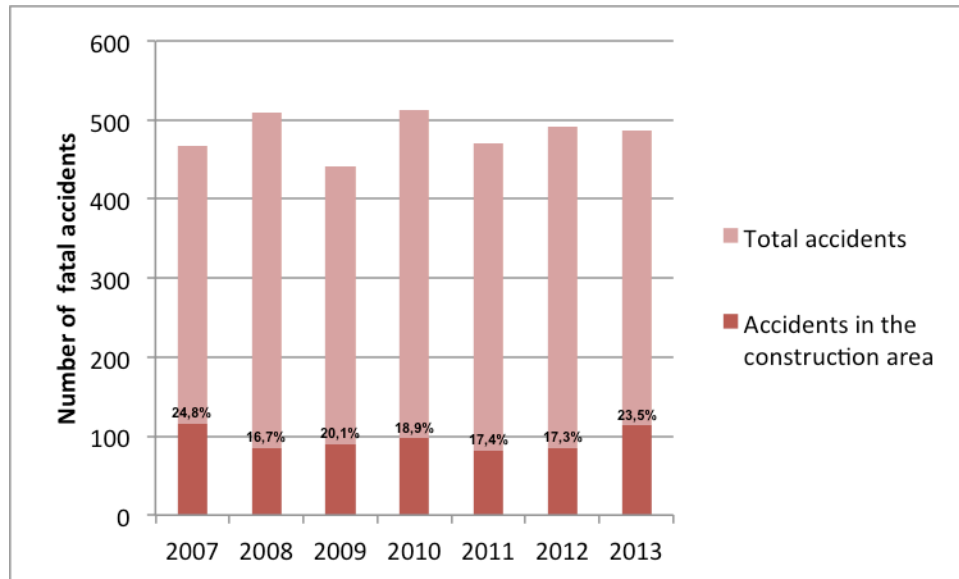


Figure 1 - Number of Fatal Accidents in Chile per Year

Source: *Departamento de Estadísticas e Información de Salud* (Department of Statistics and health information)

<http://www.deis.cl/estadisticas-laborales/>

The number of fatal accidents can be reduced through a better capacitation of the workers. An article in the safety and health magazine of Illinois explains that the best way to reduce the number of accidents is through extensive training⁴.

According to the *Universidad de Champagnat*⁵, the main objectives of training are: (1) To prepare the personnel for the execution of diverse particular tasks of organization, (2) to give opportunities for personal development and to create a more satisfying environment between the employees, (3) to increase the motivation and make the workers more open to the techniques of monitoring and management. According to the same source, investing in training is very important in every industry. It doesn't just improve the productivity due to more qualified personnel, but it helps the staff to develop personally and professionally. When a company

⁴ TROTTO, Sarah. New Workers, Higher Risk, Experts say orientation, training are crucial to keeping new workers safe. [On line] Safety + Health magazine Illinois (United States). May 2016. <<http://www.safetyandhealthmagazine.com/articles/14053-new-workers-higher-risk>> [consulta: diciembre 2016]

⁵ CAPACITACIÓN y Desarrollo Profesional del Personal por Eduardo Jaureguiberry – Adriana Arrula... [et al]. [On line] Licenciatura en RR.HH. Universidad de Champagnat. June 2002. <<https://www.gestiopolis.com/capacitacion-y-desarrollo-profesional-del-personal/>> [consulta marzo 2016]

invests in training its personnel, it adds quality and value to the final product. A qualified professional, who is specialized in his or her specific job, is capable of performing all of his required tasks safely and efficiently.

Not only is it important to train and educate the workforce in construction, but also to continuously provide further education in order to master new methods or techniques in an area that constantly changes.

The Dual System for Vocational Education is a model that has been created in Germany. The students divide their time between the vocational schools and the companies where they work. This way the apprentices can start getting practical experience from the beginning of their training, which also gives them the opportunity to start earning money.

This modality was imported to Chile through a program started in 1991 by the *Ministerio del Trabajo* and the *Ministerio de Educación* with the technical assistance of the *Agencia Alemana de cooperación Técnica (GTZ)*. It had its first pilot program in 1995.⁶

The following chapter will discuss the present state of the educational system as well as the program of the Chilean Technical-Professional Education. Secondly, the system of the *Educación Dual* (Dual Education) which is based on the German Model for vocational training will be analyzed.

The objective will be to analyze the factors that make the Dual Education in countries like Germany an attractive career opportunity for young people, while at the same time creating skilled workers for the construction area.

⁶ MINISTERIO del Trabajo y MINISTERIO de Educación. Evaluación del Programa Formación de Enseñanza Media Técnico Profesional Dual (FOPROD) Aplicado en Chile, Resumen Ejecutivo

2. Review of Educational Job Training Systems

2.1. State of the Art of the most Effective Job Training Methods

In order to determine the most effective ways of training in the business world, which information is lacking and to identify important areas for future research and evaluation to ensure that the Federal programs invest in effective practices, in 2014 the Secretaries of Labor, Commerce, Education and Health as well as the department of Human Services of the United States presented the following results:

Regarding the question about the most effective ways of training for adults, research has shown that a post-secondary education or a college degree are a key factor if a worker wants to increase his chances of employment as well as his salary. Degrees or a recognized training related to the areas that are in demand are particularly important.

Studies have found a direct link in between time of training and salaries, stating that already one additional year of training increases the salary of the worker by six to nine percent.⁷ Newer research even estimated the increase in earning as in between 10 and 15 percent per year.⁸

In 2014 the U.S. Department of Labor, Commerce, Education, Health and Human Services published a report on the effects of post-secondary education. The department found out that a result-producing training takes on average less than two years and brings valuable profit. The numbers from the year 2012 show that professionals with a post-secondary training that obtained an officially recognized license or a certification earned more than workers without these additional qualifications. This was the case for employees at every single educational level below a bachelor's degree.⁹

U.S. institutions like community colleges are trying to find new approaches on how to structure effective trainings for non-traditional students. In 2007 the U.S. Urban Institute published a report on innovative employment approaches

⁷ U.S. Department of Labor, U.S. Department of Commerce, U.S. Department of Education, U.S. Department of Health and Human Services. July 22, 2014. What Works in Job Training: A Synthesis of the Evidence. p.4.

⁸ Goldin, C. & Katz, L. F. 2008. The Race between Education and Technology. The Belknap Press. Cambridge, MA.

⁹ Ewert, S. & Kominski, R. 2014. Measuring Alternative Educational Credentials: 2012. Washington, DC: U.S. Census Bureau.

and programs for low-income families that showed the most effective ways of designing an alternative curriculum.

The institute's research suggests integrating a combination of job-specific training and schooling, more flexible schedules to integrate both school and work time and the use of new learning approaches like self-paced instruction or distance learning in order to reduce the time spent exclusively in the classroom. The study also suggests creating a more open training model with various entry and exit points in order to allow a student to leave the schooling if his personal family situation requires and come back when his situation allows it.¹⁰

Another proposal for innovative training for adults involves "Contextual and Bridge programs". These programs that are usually offered during one or two semesters in community colleges combine academic and occupational training and provide a basic education. These classes can be taken at the same time as the normal community college classes in order to speed up the learning process of the students and encourage them to continue their formation.

The Washington State Board for Community and technical Colleges developed a program called *Integrated Basic Educational and Skills Training (I-BEST)* which is co-taught by a "basic skill instructor" and an "occupational instructor" and it involves lessons from health care to advanced manufacturing.

Research by the Administration for Children and Families has shown that participants of this program were more likely to earn college credit or a credential than students in the comparison group who didn't take part in this program. However, the study also showed that there is no real impact on the long-term persistence of the students, their wages or the average working hours.

Qualitative research by the National Center for the study of Adult Learning and Literacy puts light on another key factor that has to be taken into consideration when trying to develop an efficient approach for training professionals. The study showed that students who are part of a trustworthy group of equal students with a common goal are developing their skills faster and persist longer in both classes and programs.¹¹

¹⁰ Martinson, K. & Holcomb, P. 2007. Innovative Employment Approaches and Programs for Low-Income Families. Urban Institute.

<http://www.urban.org/UploadedPDF/411467_employment.pdf> [consultation: December 2016]

¹¹ Drago-Severson, E., Helsing, D., Kegan, R., Popp, N., Broderick, M., & Portnow, K. 2001. The Power of a Cohort and of Collaborative Groups. *Focus on Basics*, pages 15-22.

In the United States over 25% of the workers state that they received some form of training at the workplace while 70% of the U.S. companies report that they offer their employees possibilities of in-service training or continued education. These forms of further formation are mostly offered to mid-level employees or workers in the management.¹² Research has found clear evidence that both employers and employees benefit from in-company training. It also states that companies benefit to an even greater extent than workers from an investment in the professional development of their employees.¹³ Companies reduce the cost of employee turnover and improve their productivity if they offer high quality training and meet the expectations of the workers.¹⁴

Another important point to consider is the involvement of the industry. Companies, educational institutes and the public workforce system need to work together to develop the most efficient training programs. In the last 10 years U.S. more and more foundations have supported these programs, including 22 regional workforce funding collaboratives, more than 80 associated workforce partnerships, and the National Fund for Workforce Solutions initiative.¹⁵

Furthermore can training that focuses on sector-specific, industry-focused and occupation-specific education increase chances of employment and receipt of credentials.¹⁶

In 2014 a random assignment evaluation of learning communities at Kingsborough Community College found out that participants in some training programs earned up to 18 percent more than other students and were more likely to find a job than the members of the control group. This study also reinforced the hypothesis that companies as well as trainees benefit from training programs.¹⁷

¹² Lerman, Robert I., Signe-Mary McKernan, Stephanie Riegg. 2004. The Scope of Employer-Provided Training in the United States: Who, What, Where, and How Much? In Job Training Policy in the United States, Christopher J. O'Leary, Robert A. Straits, Stephen A. Wandner, eds. Kalamazoo, MI: W.E. Upjohn Institute, pp. 211-244. <http://research.upjohn.org/up_bookchapters/168> [Consultation February 2017].

¹³ Lynch, Lisa M. 1994. Introduction. In Training and the Private Sector: International Comparisons, Lisa M. Lynch, ed. University of Chicago Press

¹⁴ Wagner, Shelbye. 2004. An Examination of the Utility of Training: Relationships with Turnover and Promotion. Emploria State University Department of Psychology and Special Education.

¹⁵ Woolsey, L. & Groves, G. (2013) State Sector Strategies Coming of Age: Implications for State Workforce Policy Makers.

¹⁶ Glover, R. W. & King, C. T. (2010). Sectoral Approaches to Work- force Development: Toward and Effective U.S. Labor-Market Policy. In Human Resource Economics and Public Policy: Essays in Honor of Vernon M. Briggs Jr. W.E. Upjohn Institute for Employment Research. <http://research.upjohn.org/up_bookchapters/190/> [Consultation: February 2017]

¹⁷ Maguire, S., Freely, J., Clymer, C., Conway, M. & Schwartz, D. 2010. Tuning In to Local Labor Markets: Findings from the Sectoral Employment Impact Study. Philadelphia.

Talking about the education of young people, it is especially important to expose the students to different career paths at a young age.

Programs where young students get a chance to get to know the business world, learn about job search, work routines and career planning and receive some form of academic and vocational training have been shown to have an important impact on school attendance and academic scores.¹⁸

For adults as well as for youth, a combination of industry-based and occupational training and education seems to be most effective. Research has shown that sectoral high schools show the most promising outcome when they mix academic and branch-specific, work-based skills.¹⁹

According to a research paper published in 2014 by the U.S. Department of Labor, the U.S. Department of Commerce, the U.S. Department of Education and the U.S. Department of Health and Human Services about effective training for youth between the ages of 14 and 24, young students with special challenges and issues often also have limited opportunities in the business world as adults. It is shown that these kids benefit strongly from comprehensive, integrated programs, some of which combine education, job preparation, counseling, health interventions and social services.²⁰

2.2. Educational Situations in Chile and Germany

2.2.1. General Background

After the new constitution of 1833, the authorities of Chile felt the need to establish an educational system that meets the needs of the young nation. The *Universidad de Chile* and the *Instituto Nacional* were created in Santiago along with other institutes in charge of the primary education. With the beginning of the industrialization in Chile, the country lacked skilled workers and the authorities realized that it was necessary to create an institution for the technical education. As a result of that the technical education started with the creation of the *Escuela de Artes y*

¹⁸ Samina Sattar. 2010. Evidence Scan of Work Experience Programs. Oakland, CA: Mathematics Policy Research.

¹⁹ Kemple & Willner. 2008. Career Academies: Long-Term Impacts on Labor Market Outcomes, Educational Attainment, and Transitions to Adulthood. MDRC. <http://www.mdrc.org/sites/default/files/full_50.pdf> [consultation: June 2016].

²⁰ U.S. Department of Labor, U.S. Department of Commerce, U.S. Department of Education, U.S. Department of Health and Human Services. July 22, 2014. What Works in Job Training: A Synthesis of the Evidence. Page 19-20.

oficios (School of Arts and Crafts) in Santiago that taught classes of carpentry, smithy, smelting and mechanics²¹.

Only in 1964, a modern reform was made in Chile in order to give the population a modern and socially useful education. The length of the primary education was extended to eight years and the length of the secondary education was reduced to four years, divided in *Científico-Humanista* and *Técnico-Profesional*. This formed the base for the structure of the educational system which still exists until today²² (The current system is portrayed in detail under point 2.3.2.).

In 1992, Chile copied the Dual System for Vocational Education from Germany's Dual System program as a way to fight the high rate of unemployment especially among young people, as well as the lack of high-qualified work force e.g. in the area of craftsmanship.

This program was considered an attractive solution for many countries like Chile with high unemployment rates for people under the age of 30, difficulties for recent graduated students to enter to the labor market and a lack of high-qualified work force.

According to the Ministry of Education of Chile, most of the people who choose to follow a technical education belong to the two poorest quintiles of the society²³. These students also find it very difficult to continue their education in a university due to the bad economic situation of their families. As a result, it is very difficult to progress professionally for a lot of families that are in a vulnerable social situation.

The Dual System program in Chile was first assisted by the German Corporation for Technical Cooperation (GTZ)²⁴ that contributed with the German experience in qualification of human resources.

2.2.2. Why is training so relevant for the construction sector?

Construction is one of the oldest fields of work in human history. People have been building since the beginning of time and will still continue to do so in the future. In the last years, the world we live in has been changing. This had a tremendous effect on the labor market and has affected construction companies all over the world.

Globalization and digital transformation have had a big impact on the way companies work to be able to compete. Markets expand and companies

²¹ LABARCA, Amanda, *Historia de la Enseñanza en Chile*, Publicaciones de la Universidad de Chile. Imprenta Universitaria, Estado 63. Santiago. 1939. 296 p.

²² MINISTERIO de Educación de Chile y ORGANIZACIÓN de Estados Iberoamericanos. *Sistema Educativo Nacional de Chile: 1993. Informe OEI-Ministerio*. [en línea] Organización de los Estados Iberoamericanos para la educación, la ciencia y la cultura. Santiago. 1993
<<http://www.oei.es/historico/quipu/chile/>> [consultation: July 2016]

²³ Register of Chilean students, 2008

²⁴ *Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)*

have to grow as well if they want to be able to keep up with the constantly growing economy. But what does that mean concretely for construction companies? With breakthroughs in technology and new reforms, work is becoming more complicated and the market is becoming more competitive. The U.S. Economic and Social Research Council lists extensive knowledge as a way of keeping up:

“Economic success is increasingly based on the effective utilization of intangible assets, such as knowledge, skills, and innovative potential as the key resource for competitive advantage.” (Economic and Social Research Council, 2005)

The Resource and Policy Guide for 21st Century Skills, Education and Competitiveness by the Partnership for 21st Century Skills explains that advanced and innovative economies require more educated workers with a variety of abilities concerning problem-solving, communication, information management, team work and knowledge of new technologies.

One explanation for that can be found in digitalization. As machines and computers become more advanced, they increasingly replace human beings in the work place.

We are now at a point where we can see the first effects on the labor market. Humans in construction processes like working on assembly lines are already being replaced by machines, simply because they work more efficiently. On top of that they can work 24 hours a day and 7 days a week without ever needing a break, which is a big financial benefit in the long run.

Another sector where we can see the beginning of the digitalization is driving. The first computer-driven cars are already available on the market today and technologies keep advancing faster and faster. What does that mean for professional drivers of trucks or construction machines for example? Will this job still exist in the future? It might become completely obsolete due to the financial factors or simply because of safety reasons. As soon as the technologies are licensed and authorized, it might be forbidden to work with human drivers. Machines aren't susceptible to human errors like accidents caused by tiredness or a lack of attention.

For the companies this means a big shift in recruitment. They no longer need a big amount of untrained personnel to handle all the routine tasks, they will need qualified experts that are able to organize, supervise and program the new processes.

A 2002 (Carnevale & Derochers) study by the U.S. Educational Testing Service found a drastic shift in the level of education of workers in between 1973 and 2000.

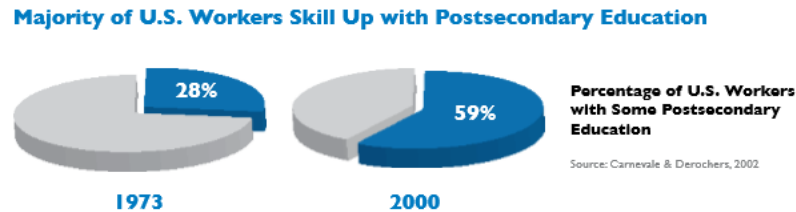


Figure 2 – Percentage of U.S. Workers with Some Postsecondary Education

Source: graphic from the article: 21st Century Skills, Education & Competitiveness, A Resource and Policy Guide. Partnership for 21st Century Skills. 2008. Data originally from: Carnevale & Derochers, 2002

While in 1973 there were just 28 percent of workers with some sort of postsecondary education, this number rose to 59 percent in the year 2000. This phenomenon affects all sectors and numbers keep rising all around the world as globalization and digital alteration become more important.

In Chile, we have been seeing a similar shift in the last years. University degrees have gained a greater and greater importance. It is important to have a university degree in order to find a good job.

One phenomenon that can be observed in Chile is that there are many graduates who don't work in their field of study. One might ask why a postsecondary education is so important, if the graduate won't be working in his field of study anyway. The answer is that many companies hire university graduates because they rely on general qualifications like abstract reasoning skills, problem solving, organization, communication and knowledge of new technologies, which are all skills that they need in order to complete a postsecondary education.

In a nationwide survey from the year 2006 in the United States, employers mentioned work ethic, oral and written communication, teamwork and critical, problem oriented thinking as the most important qualities for high school graduates or graduates with some form of postsecondary education.

So even if they aren't trained in the exact same field of work they are hired in, they already have the basic qualifications. On top of that, they have the resources to teach themselves what they need to know, because self-organizing is a big part of scientific and academic work.

What does this mean for the construction sector? As the population in Chile keeps growing, the cities grow too, also due to the centralization. This means that construction companies will have to expand to supply housing and infrastructure. In order to stay competitive in a world that is

changing, companies will have to invest in new technologies and qualified personnel. One way of achieving this goal is in-company training.

Ben Bernanke, chairman of the U.S. Federal Reserve said: “As the larger return to education and skill is likely the single greatest source of the long-term increase in inequality, policies that boost our national investment in education and training can help reduce inequality while expanding economic opportunity.”

Training can be seen as an investment in the future. Qualified workers are the basis of every functioning company and a step towards a growing economy.

The American Society for Training & Development has been researching the problem for many years. Several studies and papers have been published since 2003 that discuss the lack of qualified workers and the consequences.

In *The Human Capital Challenge* (2003) and in *Bridging the Skills Gap* (2006) the organization first explained the problem of skills shortages and described them a threat to economic growth and competition. The studies recommend a common solution with the involvement of companies, organizations and the government.

The ASTD defines a so called “skill gap” as a notable divergence between the capabilities of a company and the skills it needs to achieve these. An organization has a skill gap if it can’t fill important positions with sufficiently qualified employees and as a result can no longer grow or stay competitive. The 2012 *McKinsey Global Institute Report* predicts a worldwide shortage of 38 to 40 million highly-qualified workers and 45 million semi-skilled workers in the next 10 years.

The same problem can be observed in Chile. Many companies have difficulties finding adequate employees for certain positions. At the same time, there are people looking for work who just don’t have the necessary qualifications. On top of that, there is a high employee fluctuation. Workers usually don’t stay in one company for their whole life.

According to the data published by the *Banco Central de Chile*, the average turnover of staff in Chile between the years 2005 and 2014 reached 37%. This rate is one of the highest of all other country members of the Organization for Economic Co-operation and Development, concerning to an article published by the newspaper *La Tercera* in 2016.

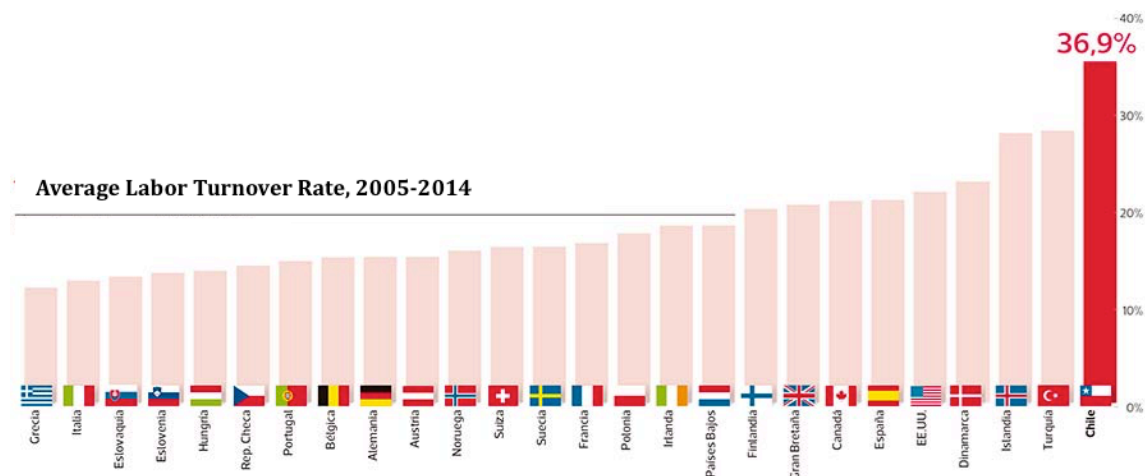


Figure 3 - Average Turnover Rate of countries member of the Organization for Economic Co-operation and Development

Source: Newspaper *La Tercera*, June 2016, data source: *Banco Central de Chile*
<http://www2.latercera.com/noticia/chile-es-uno-de-los-paises-con-mayor-rotacion-laboral-de-la-ocde-37/>

In Chile this rate was analyzed in different economic areas, finding the construction area to be the one with the highest rate of turnover of staff with 55,1%.

In 2012, the ASTD asked companies to describe their top 3 consequences of the skill gap. The answers to this survey are shown in the figure 4. With 77% the questioned firms mentioned lower productivity as the number one consequence. According to the survey, another notable result of the skill gap is lower efficiency (number one for 42%, number two 69% and number three for 38% of the companies) and higher expenses (number one for 7%, number two for 13% and number three for 38% of the companies). Other consequences are slower time-to-market (number one for 16% of the companies), less profit (number one for 10% and number two for 24% of the companies).

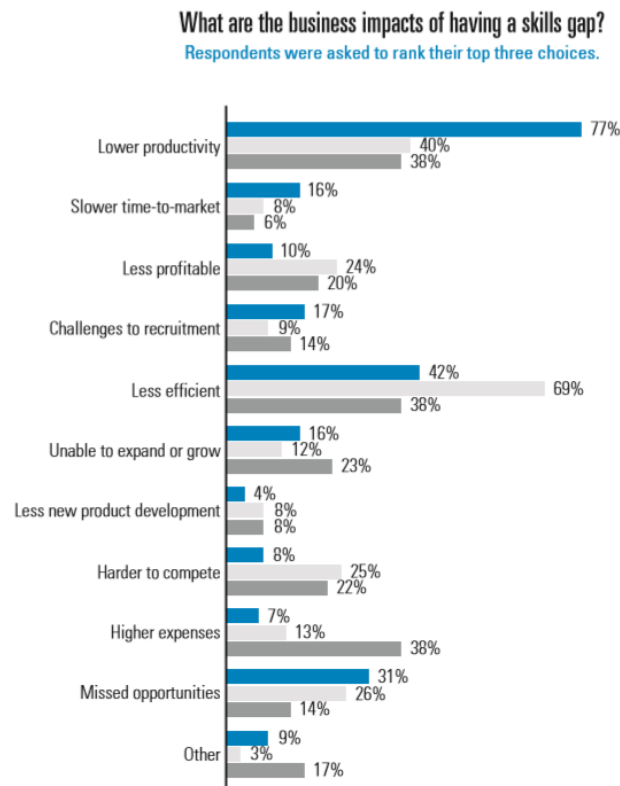


Figure 4 – What are the business impacts of having skills gap?

Source: graphic from the article: 21st Century Skills, Education & Competitiveness, A Resource and Policy Guide. Partnership for 21st Century Skills. 2008.

Lack of qualified workers and high unemployment rates seem to be two contradictory phenomena, but they are part of today's business world's reality. The McGraw-Hill Construction (2012) points towards better training in order to fight both problems:

“The low levels of employment during the recession actually may mask the way that changes in the industry, especially the growing green job market, require new skills and better training. Certification of employees is one effective way in which the industry can respond to these rising needs.”

As a result of the digitalization and required specialization of professions, sector-specific training and national certifications can be a good way of meeting the new needs of the industry.

In the following, I will present the model of the German Dual Educational System, which has been designed to tackle these problems. German workers have a global reputation for being highly qualified, working efficiently and having an overall extraordinary work ethic.

The Dual System involves workers, companies and the government to make a national standard possible. It creates the possibility to obtain a postsecondary qualification without having to study at a university. Students can start working and receiving a salary from day one and companies have the unique possibility to train a student based on their own needs.

The education focuses on two main goals: Equipping the workers with the necessary qualification and practical skills to complete their daily tasks and educating them in theoretical skills. This way, they develop for example their organizational and communicative skills and their ability of abstract, problem oriented thinking.

2.2.3. Structure of Chile's Educational System and the Vocational Training for Construction

In Chile the mandatory education is divided in primary and secondary. The primary education takes eight years to complete and is divided in two levels, while the secondary education takes four years. These 12 years of primary and secondary education are mandatory in Chile since 2003.

The secondary education can also be divided between: (1) Scientific-Humanistic (regular) and (2) Technical-Professional (vocational). The first two years are the same for the two careers, while the last two years are different depending on the type of education the student follows. This can be seen in figure 5 which schematizes the structure of the Chilean educational system.

The Technical-Professional education is designed to teach different skills to the students according to the profession they choose. After finishing the secondary education, the students who followed this education already have a degree of *Técnico de nivel medio*. This allows them to start working in their specialized area after they graduate or continue their studies in a Technical Education's Center, a Professional Institute or in a University.

The *Educación Dual* was implemented as a pilot system in 1992 in the Technical-Professional education system based on Germany's Dual System for vocational education. The main idea is that the students of this modality share their time between learning in the school and learning and collecting experience by working in a company. Today the percentage of the schools that offer Technical-Professional education under the Dual System in Chile is growing but it still remains very low. According to SIGE²⁵, in 2012 only 14% of the students following a Technical-Professional Education joined this program.

²⁵ *Sistema Información General de Estudiantes, SIGE* (Students' General Information System)

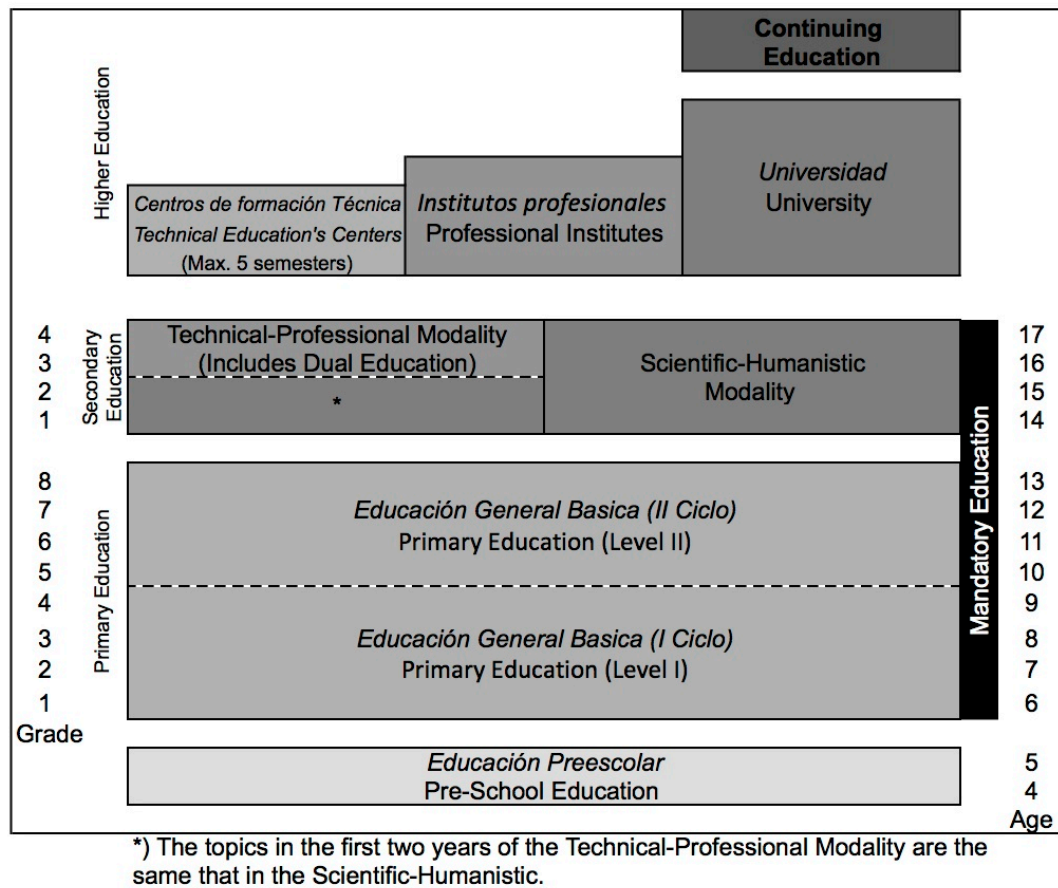


Figure 5 - Structure of Chile's Educational System

The Technical-Professional education module includes 46 professions from which the students can choose. The construction industry is represented by six professions, shown in table 2.

Table 2 - Technical-Professionals majors in the construction area

Career
<i>Edificación</i> (Building construction)
<i>Terminaciones de la construcción</i> (Completions in construction)
<i>Obras viales e infraestructura</i> (Roadwork and infrastructure)
<i>Instalaciones sanitarias</i> (Sanitary installations)
<i>Montaje Industrial</i> (Industrial assembly)
<i>Refrigeración y climatización</i> (Refrigeration and air conditioning)

The Ministry of Education controls and supervises the *Educación Dual* as it is part of the secondary education. One main problem with the

Technical-Professional education today is the maximum age of 16 for joining it, since young people at this age are often not prepared yet to make the difficult choice of a profession.

In order to offer the *Educación Dual* to older people, training courses under the Dual System were implemented through programs run by the SENCE²⁶. The program *Aprendices* is based on the Dual Education. The participants of the program, who must be between 15 and 25 years old, learn the theory in a training center and practical components in the work place at a company. This program has the double objective of generating employability for the trainee and productivity for the company through the development of competences that allow the student to perform a vocation²⁷.

It can be observed that almost all the programs based on the Dual System are just available for younger people, excluding older workers.

2.2.4. Structure of Germany's Educational System and the effectiveness of the Dual Educational System in Germany

The German educational system is basically divided in: a) Preschool education, b) Primary education, c) Secondary education²⁸, d) Tertiary education and e) Continuous education. The preschool education is optional, while the primary and the first part of the secondary education are mandatory according to the law²⁹. Finally, tertiary education and continuous education are optional. An illustration of Germany's educational system is shown in figure 6. In the figure on the left side there is a chronologic scale with the corresponding grade of study, while on the right side there is a scale with the age the pupils are supposed to have in each grade.

The compulsory education covers the primary education that takes place at the *Grundschule*, which takes four years in most of the states (*Länder*). After the primary education the pupils must make their first decision according to where they want to go. They can choose between the *Gymnasium*, the *Hauptschule* or the *Realschule*. The first option is for those pupils who want to continue a more theoretical path and later go to the university. While the first option offers a more theoretical education, the last two options lead the students towards the vocational training system among other kinds of programs as depicted in figure 6.

²⁶ Servicio Nacional de Capacitación y Empleo (National Ministration of Training and Employment). <<http://www.sence.cl/portal/Acerca-del-Sence/>> [Consultation: September 2016]

²⁷ Programa *Aprendices*.

<<http://www.sence.cl/portal/Oportunidades/Capacitacion/Aprendices/>> [Consultation: January 2016]

²⁸ The secondary education is divided in two parts.

²⁹ The compulsory education takes between 9 and 10 years depending on the state (*Land*). The school regulations are under the law of the state and there are some differences in between some of them.

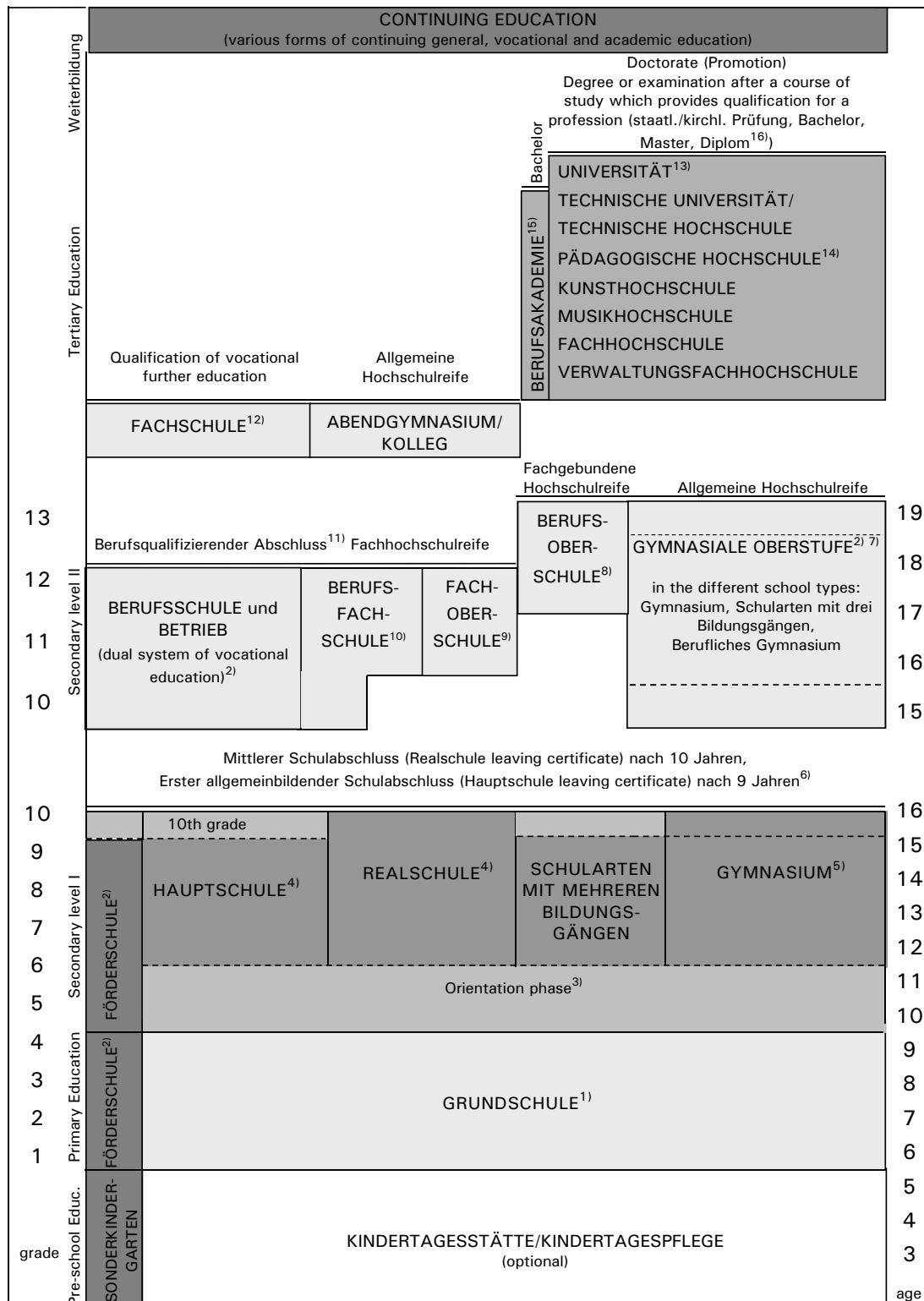


Figure 6 - Structure of Germany's Educational system

Source: The Education System in the Federal Republic of Germany 2012/1013, a model of the responsibilities, structures and developments in education policy for the exchange of information in Europe

As it is shown in figure 6, in order to enter the *Dual Ausbildungssystem* a student today has to have completed the full compulsory education. This can be done through any of the three school types of the first part of the secondary educational level. As it can be seen, the vocational training comes as an option of the second part of the secondary level, and it has no other formal prerequisites of admission.

According to the BIBB³⁰, about two-thirds parts of the students chose to learn a profession under the Dual Vocational Training System after finishing school in 2011. According to the statistics provided by the Information Network on Education in Europe (EURYDICE) about the educational background of the trainees before the program in 2011, the percentage of pupils entering after 9 years of mandatory school with their corresponding certificate (*Hauptschulabschluss*) was 31,9%. 42,1% obtained a 10 years school certificate (*Mittlerer Schulabschluss*). And 23,1% already have obtained a higher education entrance qualification i.e. they have finished the secondary education either with a *Hochschulreife* or a *Fachhochschulreife*. This distribution is shown in figure 7.

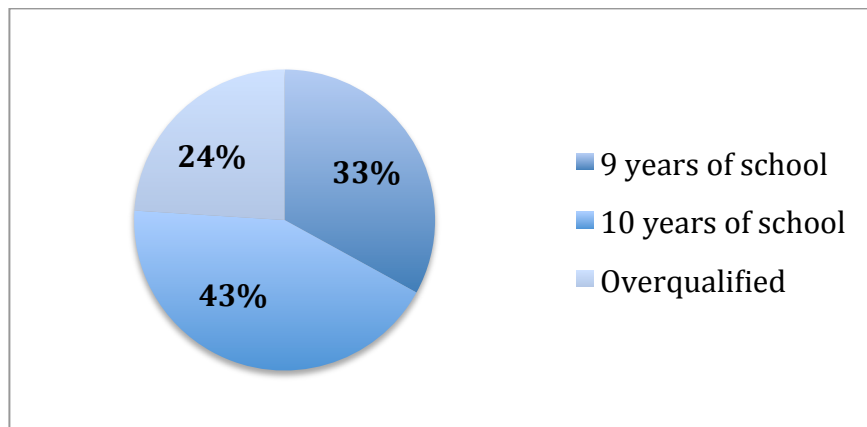


Figure 7 - Educational Background of the new trainees in 2011

Source: EURYDICE

Germany's Dual Education has become an attractive solution for countries that are in an unfavorable situation like Chile. In Europe there are countries where the number of youth unemployment rises to almost half of the young population. Some examples are Spain with 49,6%, Greece with 50,1%, Croatia with 45,5% and Italy with 40,9%³¹. Countries with this problem are looking for ways to improve the transition between school and employment and the German dual training looks like a very

³⁰ Bundesinstitut für Berufsbildung (Federal Institute for Vocational Education and Training)

³¹ *Diario La Vanguardia*, Spain.

<http://www.lavanguardia.com/vangdata/20150613/54432243021/ranking-de-desempleo-juvenil-en-europa-espana-lider-con-el-49-6.html>

attractive solution. Germany has one of the lowest unemployment rates for people under the age of 25 (6,9%).

The German Dual Vocational Training Program is designed for three main goals: (1) Economic productivity, (2) social integration and (3) individual development. This influences the three main stakeholders that are involved in the process: The private companies, the government, and the person who receives the training.

The Dual System is designed to boost the economy and therefore affect the business world positively. By putting more qualified workers on the market, it ensures a high productivity and a high quality of the products.

One of the reasons for Germany's economic stability is the high qualification of its workforce. It is a fact that the majority of Germany's workforce receives its high qualification through the Dual Vocational training system. According to Germany's Office for National Statistics, in 2012 the educational background of the workforce in Germany was distributed according to the figure 8. We see that the percentage of the workforce trained under the Dual System is double of the percentage of professionals trained under a conventional system in vocational colleges and university graduates combined.

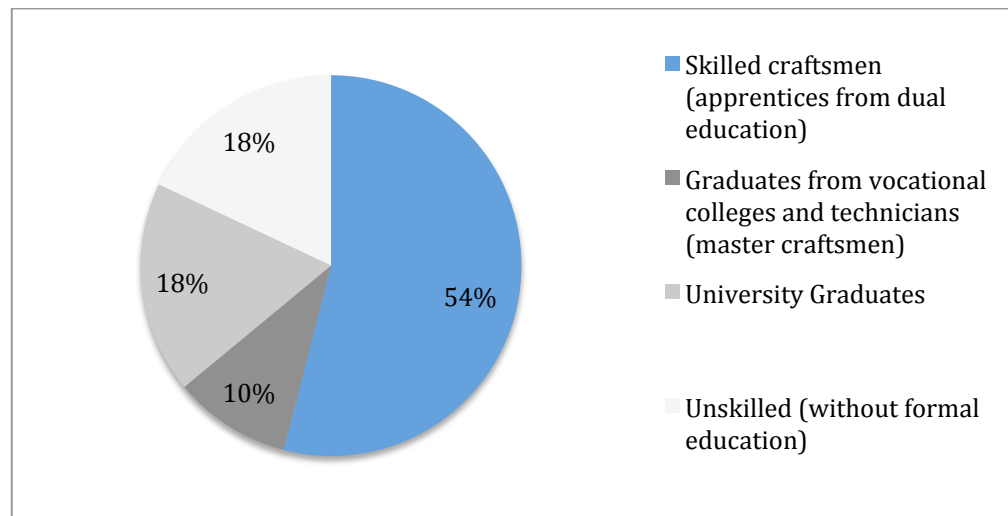


Figure 8 – Background education of the workforce in Germany

Source: Germany's Federal Statistical Office

This type of education is called Dual System because it is designed to train the young students mixing two methods: one is working in a company. Here the students learn the practical skills of their new profession together with skilled professionals and teachers. On the other side, there are the vocational schools, where the students complement their formation by learning the specific theoretical knowledge they must know to become a skilled professional.

This program forms skilled workers with real practical experience. At the end of the program the young people will be more qualified to work in

their position and familiarized with the job environment than a graduate with a conventional formation. This preparation makes it easier for the new professional to find and keep his first job.

2.3. Structure of the Dual Education System in Chile

The students who choose to follow a Technical-Professional education are usually in the second half of their secondary education³². They are permitted to enter the Dual Education if the school from which they graduated implemented this modality. At the moment, there are approximately 229 such systems in Chile³³. The student receives his education in two places: a) at the *liceo* (school) and b) in a company. The distribution of time is usually three days a week at the company and two at the school or alternatively one week each.

The school is the institution in charge of giving the students a solid general formation. This implies the development of basic competences and the technological knowledge that is needed to master their vocational training.

The performance of the trainees in the company is organized according to a *Plan de Desempeño para el Aprendizaje en la Empresa* (Performance Plan for learning in the Company). This Performance Plan is detailed in the *Manual del Maestro Guía*³⁴ (Manual of the student supervisor) and run by one employee of the company who plays the role of the *Maestro Guía* (Student supervisor). The Chilean Ministry of Education is in charge of making the Manual for the student supervisor.

The school also appoints a *Profesor Tutor* (Tutor teacher) who represents the school and is in charge of advising a group of students. He or she has to keep a constant communication with the Student Supervisor in order to ensure that the trainees achieve their objectives.

In order to participate in the Dual Education program, the schools need to organize training activities to guarantee the correct operation of the program. The school must define the vocations it will offer and adapt or create study plans for the vocations selected for the new dual program. Because the school lessons take place parallel to the work in a company, studies must be done about the labor demand in each area. This is because the program establishes that the school is obliged to formally reserve a position for every student registered in a company.

³² 3^o y 4^o año de enseñanza media, 3rd and 4th year of secondary education

³³ Qué es la educación técnica dual y cómo funciona en Chile. [on line] Educación 2020, Chile. Julio 2016 <<http://educacion2020.cl/noticia/que-es-la-educacion-tecnica-dual-y-como-funciona-en-chile>> [consultation: August 2016]

³⁴ *Manual del maestro Guía, Formación Dual, 2012. Ministerio de Educación* [on line] <http://portales.mineduc.cl/usuarios/formacion_tecnica/doc/201206121833290.Manual_del_maestro_guia.pdf>

To ensure the quality of the program, the schools must also create a monitoring plan in order to constantly update the critical information to evaluate the progress of the students.

At school, the students' classes are guided by the Curriculum established by the MINEDUC³⁵, while in the company the students follow the Performance Plan. In the following these plans are explained in detail.

2.3.1. The Curriculum

One of the important duties of the MINEDUC is the creation of the Curriculum for the different vocational careers. In this document the following extract defines one of the obligations of the Technical Schools for teaching under the dual modality:

“Para la implementación del modelo dual, el liceo deberá desarrollar un trabajo innovador, planificado, programado y cooperativo. Lo anterior, junto con el Plan de Estudio para el liceo, el plan de aprendizaje para los y las docentes (elaboración del plan de enseñanza en el aula) y el plan de desempeño para el aprendizaje en la empresa, permitirán asegurar las condiciones para el funcionamiento operativo de la formación profesional dual y así, obtener la aprobación para su implementación a partir del año siguiente.”³⁶

“For the implementation of the Dual model, the school must develop an innovative, planned, programmed and cooperative work. The above, plus the Study Plan for the Technical School, the learning plan for the professors (elaboration of the teaching plan in the classroom) and the Performance Plan for learning in the company, will allow to ensure the conditions for the operation of the Professional Dual Formation, and so, its approval for its implementation for starting next year.”

The Curriculum for the careers in the construction area is shown and described in annex A. It shows the essential topics that the students must learn in the two years of the program for becoming a *Técnico Profesional del Nivel Medio* (Technical-Professional of the medium level).

The topics can be taught at the school alone or partly at the school being complemented by the training at the company. This will depend on the Performance Plan of each educational institution.

³⁵ Ministry of Education of Chile

³⁶ Source: *Programa de Estudio, Formación Diferenciada Técnico-Profesional, Sector Construcción*. (Curriculum, Technical Education, Construction area). [on line]

<http://www.curriculumenlineamineduc.cl/605/articles-34315_programa.pdf> [Consultation: August 2016]

The advantages and disadvantages of this system will be discussed ahead in chapter 3.

2.3.2. The Performance Plan Defining Learning Objectives

The Performance Plan is adapted to the situation in each company and varies depending on the specific details concerning study areas and tasks of the student at the company.

The Performance Plan states that the students have to learn how to execute the selected tasks in a responsible and autonomous way. It must be clear that this is an ongoing process, where the apprentices help the qualified and experienced workers as assistants. The workers must explain the process to the trainees and delegate tasks while supervising them constantly. The complexity of the tasks the apprentices perform will depend of the individual progress of each student.

The *Plan de Rotación* (Rotation plan) complements the Performance Plan. It specifies the organization of the performed tasks and is a useful tool to document each student's progress.

The Student Supervisor is in charge of the elaboration of the Rotation Plan. An example of a Rotation Plan's file is shown in figure 9. It specifies the task, the person in charge, the date and duration and the activities the apprentices must perform in the work place.

Ficha de un Plan de Rotación			
Alumno/a: _____			
Especialidad: _____ Nivel: _____ Nº _____			
Departamento / Sección / Sala	Encargado	Desde / Hasta	Especificación de actividades del alumno en el lugar del trabajo

Figure 9 - Rotation Plan

Source: *Manual del maestro Guía, Formación Dual, 2012. Ministerio de Educación*
http://portales.mineduc.cl/usuarios/formacion_tecnica/doc/201206121833290.Manual_del_maestro_guia.pdf (page 19)

After two years of training in the company, it must be ensured that the apprentice is familiar with all the activities established in the Performance Plan.

The rotation through the different tasks at the company must ensure that the students are able to gain experience in many different areas of their vocation.

In the current system, each school has a lot of freedom on how to design their Performance Plan. As a negative effect of these many liberties, different schools may create very different Performance Plans. This could lead to inequalities in skills and knowledge between the graduates from different schools when applying to the same job giving advantages or disadvantages to certain students depending of the school they attended. It is apparent that there is a need to generally homogenize the competences that the trainees learn at the companies through a common standard for a nation-wide established Performance Plan.

Since its start in 1992, the Dual System of education has grown positively and the interest of the schools in taking part in this system has been much better than expected³⁷.

Figure 10 shows the number of schools participating with their corresponding financial system from 1992 to 2012. Nevertheless, due to its youth, the number of schools that participate in this system today is still low compared to its German prototype.

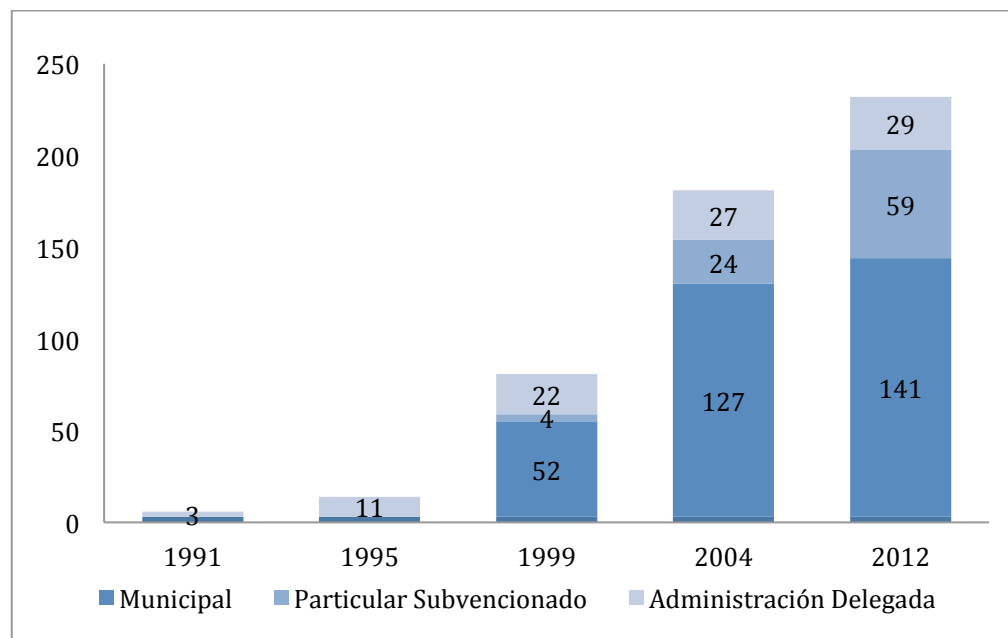


Figure 10 - Liceos under the Dual formation according to their financial type

³⁷ According to the implementation's analysis of the program FOPROD, U. de Chile 2001

Source: SIGE, *Sistema de Información General de Estudiantes*

The Dual System was exported from Germany, a country that is different from Chile in many aspects (in its administration, educational system, financing system, culture, etc.). This generated doubts about the success of importing the program to Chile in the beginning due to the differences between these two countries.

Studies about exporting Germany's Dual System of education strongly recommend not copying it. Some experts say that this system cannot be exported to South America due to the huge economic differences, the training tradition and the educational structure in South America compared to Germany³⁸.

These differences must be taken into consideration when designing the characteristics of the Dual vocational training system. These factors will determine a strategy to implement the system effectively³⁹.

For these reasons the Chilean government was slowly introducing the program in 1992, adapting it to the Chilean institutional structure and training tradition. This entailed making significant changes from the original system in order to create a good reaction to the program in Chile. At the moment, companies and schools are enthusiastic to participate in this new vocational program.

In 2012, according to the General System of Information on Students (SIGE)⁴⁰, 24% of the schools that offer technical education adapted the Dual System. These 26.662 students are distributed in 229 schools along the country. Nevertheless, most schools are located in the capital Santiago. The distribution of the *liceos* that teach with the Dual Education system is shown by region in figure 11.

³⁸ Germany's dual vocational training system: a model for other countries? – Prof. Dr. Dieter Euler

³⁹ Germany's dual vocational training system: a model for other countries? – Prof. Dr. Dieter Euler

⁴⁰ *Sistema de Información General de Estudiantes, SIGE*

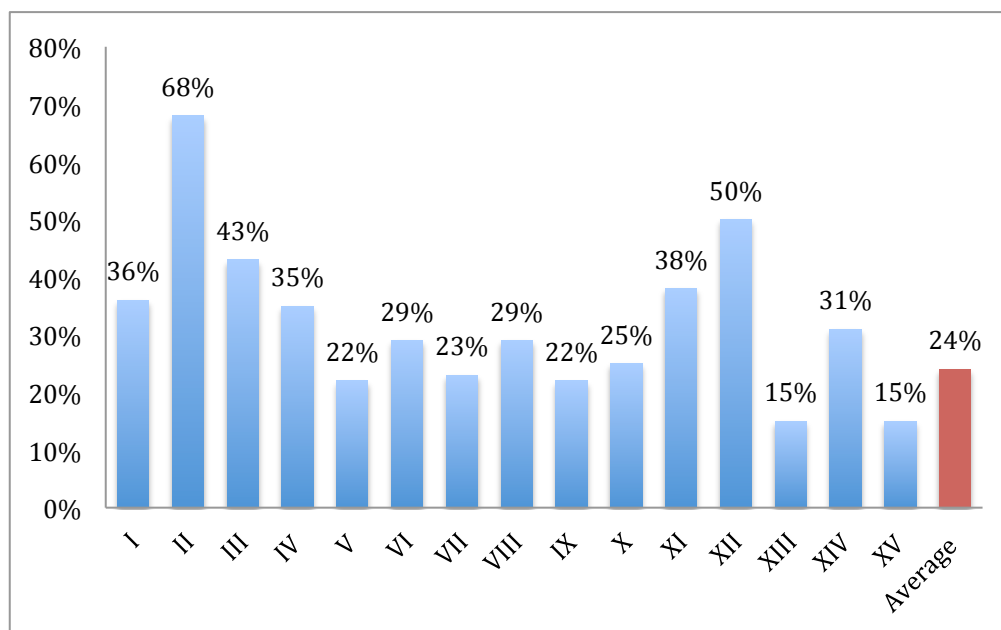


Figure 11 - Percentage of training schools per region that have Dual Education.

Source: SIGE, Sistema de Información General de Estudiantes

According to the same source, 14% off all the students registered in 2012 following a technical education are doing it under a Dual System. The distribution of the students registered, according to the economic sector they belong to, is shown in figure 12.

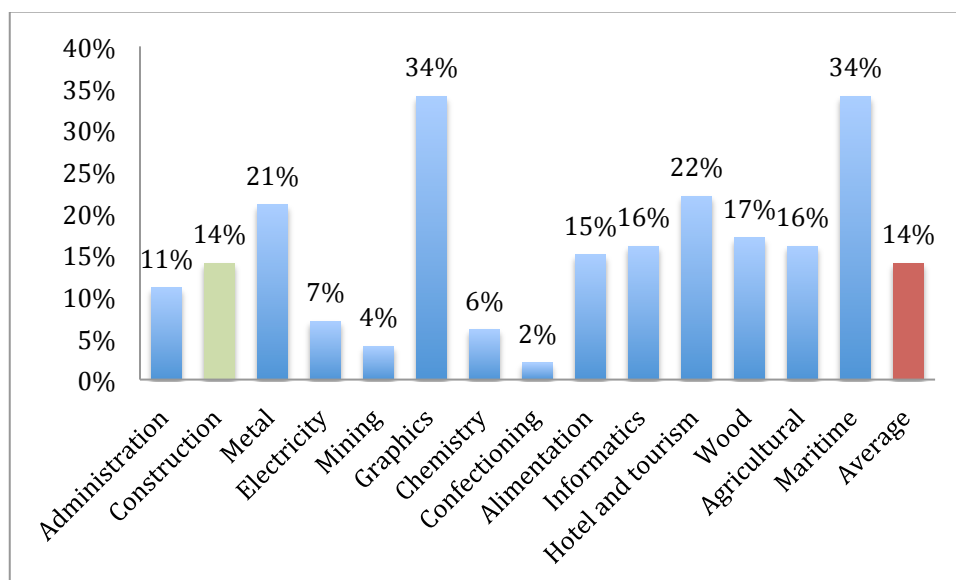


Figure 12 - Distribution of registered students according to the economic sector (2012)

Source: SIGE, Sistema de Información General de Estudiantes

It is interesting to note that from all registered students who learn one of the professions related to the construction area, only 14% of them do it under the Dual System.

2.4. Structure of Germany's Dual Educational System

In Germany, about two-third parts of the young people choose to follow a vocational education under the Dual System⁴¹. Completing this program takes two or three years after finishing secondary education depending on the occupation. In the Dual System a part of the training takes place at a vocational school called *Berufsschule*. The trainees usually have to spend in between three and four days of the week at their company and in between one and two days at the vocational school. How they distribute their time depends on many factors that are established in their Performance Plan. This program is designed to provide its participants with the vocational skills, knowledge, qualifications and the necessary professional experience through the length of their training.

In Germany the responsibility of caring for the educational system lies on the state (*Land*), unless the constitution (*Grundgesetz – R1*) concedes legislative power to the state.

The Vocational Training System is basically divided in two big areas: a) Theoretical knowledge and b) practical skills according to the training regulations (*Ausbildungsordnung*). In fact, there exists a vocational school curriculum (*Rahmenplan*) for complementing all the topics of the training taught at the company. These two regulations for the Vocational school and for the training at the company are regulated under the government law and the law of each state respectively and called *Berufsbildungsgesetz* and *Schulgesetz*.

In 1972, a committee for vocational education and training⁴² was created under federal law in order to regulate the shared responsibilities in administrating the educational system between states and federal government. Its purpose was to deal with fundamental issues concerning organization and planning of the program. The tasks of the committee go further than being an intermediary between the two groups. It works as a joint organism with a common objective: To care and re-structure the training regulation and Curricula for the vocational programs according to the demand of the constantly changing conditions of the professional world.

⁴¹ Source: Germany's Federal Institute for Vocational Education and Training, 2011

⁴² *Bundesinstitute für Berufsbildung, BIBB*

In this committee the federal government is represented by: a) the federal ministry of education and research⁴³, b) the federal ministry of economics and technology⁴⁴ and c) the ministry responsible for the corresponding occupation areas. Furthermore, there is a participant from each corresponding state on every conference.

Figure 13 shows a resume of the operation structure between the companies and the Vocational Schools. It shows how the private and the public sector work together. As we see on the left, the government (in dark gray) approves the companies (in light gray) that can take place in the Dual System and supervises the appropriate implementation of the program in the company. On the right side, it is shown that each state (in dark blue) regulates the schools (in light blue) and its programs. The states and the government cooperate in the organization of the program, while vocational schools and the private companies coordinate the implementation.

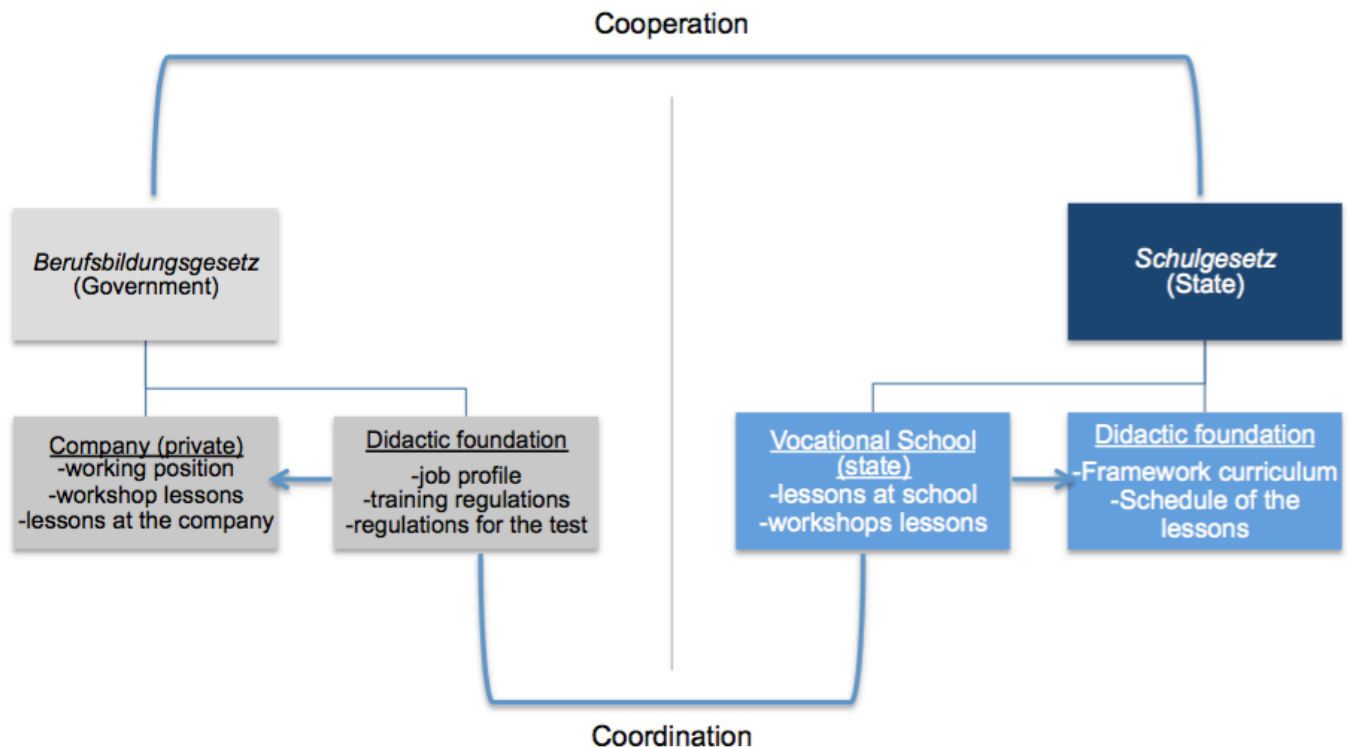


Figure 13 - Structure of the Germany Dual System

Source: *Übergänge und Aufbau des Deutschen Bildungssystem*,
Technische Universität Kaiserslautern

⁴³ Bundesministerium für Bildung und Forschung, BMBF

⁴⁴ Bundesministerium für Wirtschaft und Technologie, BMWI

2.4.1. The Dual Education in Building Construction

The training in the construction area in Germany is divided in subcategories.

To learn a vocation in this area in Germany, the students usually study for three years. While the first year is the same for everybody, the second and third year focus on the specialty each person follows. The three specialties in Building Construction in this area are shown in table 3.

Table 3 – Specialties in the building construction area (Germany)

Specialties	
1	<i>Maurer</i> (Mason)
2	<i>Beton- und Stahlbetonbauer</i> (Concrete, reinforced iron and rebar worker)
3	<i>Feuerungs- und Schornsteinbauer</i> (Refractory and chimneys worker)

The topics defined in the first year of training for building construction workers under the Dual System of training in Germany are shown in Table 4. A detailed description of each topic can be found in the *Verordnung über die Berufsausbildung in der Bauwirtschaft Vom 2. Juni 1999. Anlage 1 (zu § 6)* (Regulation for the vocational education in the construction sector from June 2th. 1999. Annex 1, paragraph 6).

Table 4 – Germany's Curriculum for Building Construction Workers, first year⁴⁵

Nr.	<i>Teil des Ausbildungsberufsbildes (Content of the trained occupation)</i>
1	<i>Berufsbildung, Arbeits- und Tarifrecht</i> (Vocational Education, labor and collective bargaining law)
2	<i>Aufbau und Organisation des Ausbildungsbetriebes</i> (Structure and organization of the training company)
3	<i>Sicherheit und Gesundheitsschutz bei der Arbeit</i> (Safety and health protection at work)
4	<i>Umweltschutz</i> (Environment protection)
5	<i>Auftragsübernahme, Leistungserfassung, Arbeitsplan und Ablaufplan</i> (Assumption of an order, activity recording, work plan and time schedule)
6	<i>Einrichten, Sichern und Räumen von Baustellen</i> (Set-up, safeguarding and clearing the construction site)

⁴⁵ Source: *Verordnung über die Berufsausbildung in der Bauwirtschaft Vom 2. Juni 1999* (Regulation for the vocational education in the construction sector from June 2th. 1999, page 1132)

7	<i>Prüfen, Lagern und Auswählen von Bau- und Bauhilfsstoffen</i> (Testing, lodging and choosing the construction- and auxiliary materials)
8	<i>Lesen und Anwenden von Zeichnungen, Anfertigen von Skizzen</i> (Reading, interpretation and drawing of graphics and plans)
9	<i>Durchführen von Messungen</i> (To execute measuring)
10	<i>Bearbeiten von Holz und Herstellen von Holzverbindungen</i> (How to work and manufacture timber work joins)
11	<i>Herstellen von Bauteilen aus Beton und Stahlbeton</i> (Production of elements of concrete and reinforced concrete)
12	<i>Herstellen von Baukörper aus Steinen</i> (Production of stone structures)
13	<i>Einbauen von Dämmstoffen für den Wärme-, Kälte-, Schall- und Brandschutz</i> (Assembling of isolating materials for the worm, cold, acoustic and fire protection)
14	<i>Herstellen von Putzen</i> (Confection of rendering on walls)
15	<i>Herstellen von Estrichen</i> (How to screed)
16	<i>Ansetzen und Verlegen von Fliesen und Platten</i> (Positioning and fixing of tiles and flagstones)
17	<i>Herstellen von Bauteilen im Trockenbau</i> (Production of drywall elements)
18	<i>Herstellen von Baugruben und Gräben, Verbauen und Wasserhaltung</i> (How to do excavations and trenches, shoring and ground water control)
19	<i>Herstellen von Verkehrswegen</i> (How to implement traffic routes)
20	<i>Verlegen und Anschließen von Ver- und Entsorgungsleitungen</i> (Installation and connection of supply and disposal lines)

In the regulation for the vocational education it is established that: a) the topics one to four must be taught during the whole training and b) the topics five to nine should be taught by including them in another activity. The list and description of all the topics for all years are shown in the annexes B and C respectively.

2.5. Financing of the Dual Systems

2.5.1. Financing of the Education in Chile

In Chile the funding for the Dual Education comes from three sources. The main contributors are the schools alone or alternatively both schools and students depending on the type of school (*Municipal, Particular Subvencionado, Administración Delegada*).

The companies on the other hand are responsible for the payment of the training of the student-apprentice in the company. This system is similar to the German model, with the difference that in Germany the states (*Länder*) alone finance the education of the students in the Technical Schools.

The schools that participate in the Dual Education program must also cover the costs to train the professors and create the curriculum for the students. They are also responsible for finding a position for the student to work in a company. In some cases the schools also share the transportation expenses for the students who work in the company.

In the classic system for the Technical-Professional education, the costs very depending on the use of the machinery and technological equipment of the school.

The average cost for a company to train a student was estimated as \$27.440 per student. The contribution of the companies equals to 187% of the subsidies spent on the technical area, 150% on the industrial area and 70% on the commercial area. The costs to train a student under the Dual System are in average the double compared to the traditional Technical-Professional education in Chile, and the companies have to pay for this difference⁴⁶.

After evaluating the performance of the students who participated in this program, 84% of the interviewees in the companies said that the apprentices benefited the company estimating the contributed work and the costs for their formation⁴⁷.

⁴⁶ Source: *Evaluación del programa Formación de enseñanza media Técnico Profesional Dual Aplicado en Chile* [on line] p.22

<<http://empresas.sence.cl/documentos/estudios/EstudioEvalProgDUAL.pdf>> [consultation: September 2016]

⁴⁷ Source: *Evaluación del programa Formación de enseñanza media Técnico Profesional Dual Aplicado en Chile*

<http://empresas.sence.cl/documentos/estudios/EstudioEvalProgDUAL.pdf> (page 23)

2.5.2. Financing of the Dual Education in Germany

The association between the government and the business community also includes financing issues. It is the government and the business community who contribute in different ways to finance the vocational training. The companies themselves mainly finance the in-company training, while the vocational schools that work together with the training companies receive public financing by the states (*Länder*).

In 2010, according to the Federal Office for Statistics of Germany, the vocational training outside the school sector has reached costs around 7.7 billion Euros. The costs of the vocational schools, which are mainly financed by the States (*Länder*), were about 8,6 billion Euros, while the government contributed with 2,4 billion Euros. These expenses consisted of programs to promote additional in-company and external training places, vocational training assistance from the Federal Employment Agency (*Bundesagentur für Arbeit*) and promotion of vocational training for disadvantaged young people from vulnerable social situations.

The private sector plays a fundamental role for the operation of this program. Not only because the training takes place at the companies as well as in the schools but also because the companies finance a big part. Knowing this, a question we have to ask is: Why are the companies interested in paying for this training? The answer lies in the benefits that the companies get from their participation in this training program. These benefits are not only financial, but are also related with the development of the company in the future.

Due to the Dual System, the German labor market has a great amount of skilled workers. A common problem for many companies is that they don't plan their growth very far ahead. This leads to a lack of skilled workers in the company creating disadvantages in its competition. The approach of the dual program states that the companies should invest on their future workforce. There are four main reasons for why the companies should invest in training the workers themselves⁴⁸.

- a) The education and training of the new worker costs less than the profit made through his working power. The costs of the training are compensated by what the new employee contributes after finishing his formation. Already during his training part of the expenses are compensated by his work as an apprentice.

⁴⁸ Source: www.frankfurt-main.ikk

- b) Training their own workers eliminates the long-term recruitment costs. These costs usually consist of advertisement by different media, administrative expenses and interviews, which cost time and money.
- c) The introduction of a new employee also implies expenses for a company. In average it takes around three months for a new worker to learn how to perform his new job efficiently. This is due to a process of adaptation of the new employee. He or she faces a new environment (new workplace, new co-workers, etc.), must learn his/her new responsibilities and get to know the dynamic of the company. These expenses would be avoided by hiring a person who was trained in the same company who already faced these problems at the beginning of his training.
- d) Unfortunately, new employees from outside receive salaries in between 10 and 15 percent higher than an employee who already worked in the company as a trainee. The starting salary of a new professional versus a person trained in the company is significantly higher. Companies who train their own personal have a salary structure lower than companies who don't train, making it more attractive for a company to hire staff they trained themselves.

In 2004 the *BBIB* ran a survey in the companies that were part of the vocational educational system to identify the main reasons why the companies participate in this system. The results are shown in table 5. As it can be noticed, the reasons one, two and four of why companies decide to be part of the system are related to their interest in finding better specialist according to the company's needs (the first two with more than 90 %). One other trend highlighted by reasons six and seven highlight the savings and effectiveness of recruiting new personnel.

Table 5 - Reasons why German Companies take part in the Dual Educational System

Reason for Participating In the Dual Education Program		
1	The own trainees meet the company's needs	94%
2	Acquisition of specialists is not available on labor market	93%
3	Possibility to choose the best candidate at the moment of employment after the end of the training	72%
4	Low labor turnover through loyal employees	71%
5	Improving the competitiveness of the company in the future	64%
6	Avoiding risk of wrong hiring of external candidates	58%
7	Time and cost saving instead of settling-in of external personnel	56%

Source: Vocational Training "Made in Germany", Germany's Dual System of Vocational Education and Training (VET) – Germany Trade and Invest, 2014

2.6. Monitoring and Evaluation of Student Performance

2.6.1. Monitoring and Evaluation of the Students under the Dual System in Chile

The bases for monitoring and evaluating the students during their time in a company are described in the following section.

Monitoring

The supervisor of a province in all the Regional Departments of Education is in charge of monitoring the Dual System. In general the supervisors maintain a constant communication with all the schools, especially the ones under the Dual System, as well as with the *profesores tutores* to monitor the development of the Dual System, support and control the accomplishment of the rotation plan and the evaluations of the students in the companies. However, the Regional Departments don't have direct access to the companies. The Tutor Teacher keeps in contact with the company.

Evaluation

According to the *Manual del maestro Guía*, the evaluation of the performance at the company must be done every two months and communicated to the school. It needs to be executed according to a form provided in the same handbook. It is advised to realize the evaluation together with the apprentice to strengthen the positive aspects and correct any insufficient performances of the student⁴⁹. The evaluation form of the handbook is shown in the figure 14.

The students must also register all the activities or tasks that the student supervisor gives them in a *Cuaderno de Informe* (Notebook Report). This is an element of communication between the student supervisor and the Tutor Teacher. The student will hand in the notebook report to the Tutor Teacher as a tool to evaluate the progress of the student at the company.

The notebook report is a technical report elaborated weekly by the student. In it the student details the activities that he or she does, observes or learns in the company. The reports that the student writes in the Notebook should be short. If he has to write longer reports about a specific topic he can ask the Student supervisor for help. The student must also complement the report with simple drawings to describe the

⁴⁹ *Manual del maestro Guía, Formación Dual, 2012. Ministerio de Educación.* p.21 [on line] <http://portales.mineduc.cl/usuarios/formacion_tecnica/doc/201206121833290.Manual_del_maestro_guia.pdf> [consultation: July 2016]

tasks. An example of a page of the notebook report is shown in the figure 15. It shows how the student must organize his notes and estimate the time he spent on every task.

PAUTA DE EVALUACIÓN DE COMPORTAMIENTO Y DESARROLLO PERSONAL

Alumno/a Aprendiz: _____		Especialidad: _____		
Empresa: _____		Sección/Sala/Nivel: _____		
Maestro/a Guía Sr/a. Srta.: _____		_____		
Semestre: _____	Curso: _____	Periodo evaluación: _____	Desde _____	hasta _____

Aspectos a evaluar	Insuficiente	Suficiente	Bueno	Muy Bueno
PUNTUALIDAD Se presenta puntualmente a su jornada de trabajo.				
CREATIVIDAD Aporta ideas propias al realizar las actividades que se le encomiendan.				
ESPIRITU DE COOPERACIÓN Muestra disposición para realizar las actividades que se le encomiendan.				
ACTITUD FRENTE A IMPREVISTOS Frente a situaciones imprevistas, pide y/o sigue las instrucciones dadas.				
ACEPTACIÓN DE CRÍTICAS Acepta de buena forma las críticas que se le hacen y se esfuerza por rectificar sus errores.				
HONESTIDAD Y RESPONSABILIDAD Reconoce sus limitaciones y pide ayuda cuando la necesita.				
INTEGRACIÓN A LA EMPRESA Respeta el orden jerárquico, las normas y el reglamento interno de la empresa.				
RESPETA LAS NORMAS DE PREVENCIÓN DE RIESGOS DE ACCIDENTES				
CALIDAD DEL TRABAJO				
EFICIENCIA EN EL TRABAJO Tiempo empleado y buen uso de los recursos				
HABILIDAD EN EL USO DE MÁQUINAS, EQUIPOS Y HERRAMIENTAS				

APRECIACIÓN DEL MAESTRO/A GUÍA:

CRITERIOS DE EVALUACIÓN:
Muy Bueno: Asegura el progreso creciente del aprendiz;
Bueno: Progreso lento y satisfactorio;
Suficiente: Progreso incierto, se recomienda dar énfasis a aspecto deficiente;
Insuficiente: Progreso comprometido, debe mejorar.

ALUMNO/A-APRENDIZ
PROFESOR/A-TUTOR
MAESTRO/A GUÍA

Figure 14 - Evaluation Form of behavior and personal development

Source: *Manual del maestro Guía, Formación Dual, 2012. Ministerio de Educación*
http://portales.mineduc.cl/usuarios/formacion_tecnica/doc/201206121833290.Manual_del_maestro_guia.pdf (page 22)

Ejemplo de una hoja del Cuaderno de Informe

Resumen semanal N° del al de de 20		
Sección:		
Días	Trabajo realizado	Tiempo
LUNES		
MARTES		
MIÉRCOLES		
JUEVES		
VIERNES		
INFORME DE TRABAJO		
Observaciones del Maestro/a Guía: Revisado y consultado con alumno/a		
Firma del Maestro/a Guía Fecha		
Firma Profesor/a Tutor Fecha Firma Apoderado/a:		

Figure 15 - Example of a page of the Notebook Report

Source: *Manual del maestro Guía, Formación Dual, 2012. Ministerio de Educación*

http://portales.mineduc.cl/usuarios/formacion_tecnica/doc/201206121833290.Manual_del_maestro_guia.pdf (page 22)

The Tutor Teacher will evaluate the tasks performed by the apprentice and his Notebook Report. The student can get a grade between one and seven, where one is insufficient, four is the minimum accepted and seven is very good. The weighing for the evaluation is 70% for the tasks performed at the company and 30% for the notebook report.

2.6.2. Monitoring and evaluations of the Students under the Dual System in Germany

Every apprentice must do an interim examination in the middle of his training and a final examination at the end of his formation (*Zwischenprüfung* and *Abschlussprüfung* respectively). While the interim

test is used to ascertain the level the apprentice has reached, the final test shows that he has acquired all the necessary professional qualifications⁵⁰. For both examinations the competent chamber will establish boards of examiners consisting of at least three members: employers' and employees' representatives in equal numbers and at least one vocational school teacher. The application to these tests is done by the companies or by the apprentice himself.

The skills examined are specified in the corresponding training regulations of each vocation. According to the occupation, they may include a test of practical and/or theoretical skills. The practical examination will call for samples of work and/or test work-pieces. The theoretical test is conducted as a written and/or oral examination²⁹.

The written tests are centralized, i.e. the tests for each career are the same in all Germany and take place at the same time. This has the purpose of making it fairer for all the students, no matter where they are located. Furthermore, the results become objective and can be compared through all the country.

When an apprentice fails a test, he can re-take it two more times. Usually the tests take place twice a year, which gives the students in total one more year to accomplish the formation.

After the apprentice passes the tests, he receives an examination certificate issued by the responsible chamber. This certificate is not an authorization. Its principal purpose is to show that the person concerned has acquired the qualifications necessary for a specific occupation. But it is also the basis for professional progress and career advancement.

Passing the final examination is one of the conditions for the admission to the Masters' examination and many other further training examinations.⁵¹

⁵⁰ Source: Vocational Training in Germany – The Dual System, HK Hamburg Chamber of Commerce

⁵¹ Source: Vocational Training in Germany – The Dual System, HK Hamburg Chamber of Commerce

2.7. Model of Participants in the Dual System in Chile

The previous points presented a complex system of overarching relations between the different institutions in the educational system. The figure 16 offers a schematic model to distinguish between the main elements and their relation. In particular, it highlights the organization and execution logistic of the basis plans to run the Dual Education.

As mentioned earlier, the three main groups integrated in this system are: a) The Private Industry (companies), b) the Technical Schools and c) the Government.

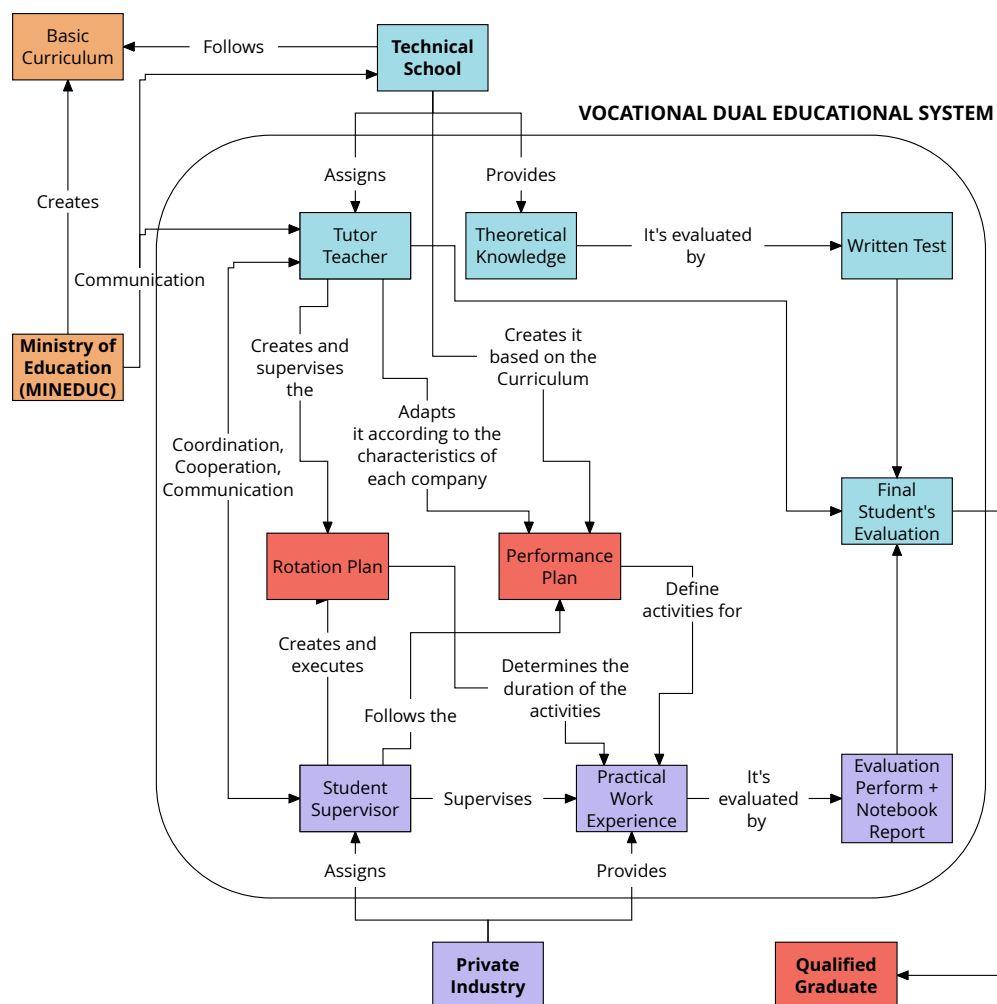


Figure 16 - Model of the Chilean Dual System of Vocational Education

The Technical School is in charge of organizing the Dual Educational system. It creates the Performance Plan, which defines the topics and tasks the students must learn during their time working in the company. This plan must be based on the Curriculum.

The representative of the Technical School is the Tutor Teacher. He or she adapts the Performance Plan to the characteristics of each company, supervises and evaluates the performance of the students and keeps a constant communication between the other entities.

The agency that represents the government is the Chilean Ministry of Education (MINEDUC). This ministry is in charge of creating and updating the Curriculum with the topics the students need to learn through their formation. The Ministry of Education also supervises the correct operation of the system by keeping a periodic communication with the Technical Institute and the Tutor Teacher.

The companies are a private entity that finances the practical part of the education of the students that learn a vocation. They provide the infrastructure and the necessary resources for the apprentice to have a real contact with the work reality of their vocation. The person in charge of the Dual Education in the company is the student supervisor. He or she is in charge of interacting with the other entities to make the program work correctly.

Currently, the Dual Education is basically based on two main plans: The Performance Plan and the Rotation Plan. The first one establishes which skills or competences described on the Curriculum the student will learn in his time at the company, while the second one specifies the dates in which each student will perform the activities to learn those skills. Because each school designs its own Performance Plan, this plan varies depending on the school the student attends.

At the end of the process, the students must pass all their evaluations at the Technical School which test their theoretical knowledge. The students also need to have a satisfactory evaluation by their Tutor Teacher to graduate.

2.7.1. The actual Curriculum

As explained under point 2.3.1, the Ministry of Education is in charge of creating and updating the Curriculum for all the Technical Schools nationwide. Based on this, each school must create its own teaching plans to implement the Dual Education. It includes a learning plan for the topics taught in the classroom and a Performance Plan for the topics the students will learn in the company. That implies that each school chooses which topics are taught in the school and which ones in the company.

This can create disadvantages between students graduating from different schools when an institute designs a plan different from the other. If a school cannot include an important topic into the Performance Plan due to an internal

reason, the graduated student from this school will face a competitive disadvantage compared to another graduate from a school that included this particular skill in its Performance Plan. Therefore, it is better to create a plan where all the students get the same knowledge.

A new plan will be developed in the chapter four to eliminate the problems mentioned before. This plan is based on the creation of a second Curriculum for the company, which is discussed under point 4.3. This will reduce the differences between students from different schools by regulating the key topics taught in each Technical School and in the companies.

2.7.2. Assessment Method of Student Knowledge and Skills

Currently, for finishing a vocational career under the dual modality, the students need to separately: (1) Pass all the written tests corresponding to the theoretical knowledge defined in the Curriculum of their vocation in the Technical Schools and (2) Obtain a satisfactory evaluation by their Tutor Teacher evaluating their working time in the company. This second evaluation is also in the Student Supervisor's responsibility and should be based on the performance of the student and on the notebook report the student makes during his time at the company.

The ministry of education supervises the correct operation of the system but it is the Tutor Teacher that evaluates the students at the end of the process for their work at the company. He bases his evaluation on:

- a) The reports he makes on his visits to the company.
- b) The performance evaluations made by the student supervisor. The student supervisor doesn't evaluate the apprentice directly, but he expresses a recommendation towards the Tutor teacher.⁵²
- c) The notebook report made by the student. In this notebook the student details how to perform many tasks required in his vocation. All the tasks the student must learn in the company are described in the Performance Plan designed by the Technical School.

The student doesn't always have to perform a practical test to measure his skills. It is the job of the Tutor Teacher to ensure that the student learns all the basic skills in his time in the company.

2.7.3. Communication between the involved entities

The only communication channel existing between the school and the company is the Tutor Teacher. He keeps periodical contact with the Student Supervisor to check the status and progress of the students he is in charge of. Usually the Tutor Teacher is in charge of groups of students, therefore, the

⁵² *Manual del maestro Guía, Formación Dual, 2012. Ministerio de Educación* [on line]
<http://portales.mineduc.cl/usuarios/formacion_tecnica/doc/201206121833290.Manual_del_maestro_guia.pdf> [consultation: September 2016]

communication between all the participants of the system depends a lot on one person.

The communication between the companies and the other entities could be improved. There is no direct communication channel between the company and the Ministry of education, which makes the flow of information slower.

3. A Developed Chilean Model for a Dual System Education

3.1. Identity of the Vocational Education

As discussed in chapter 2, young students choose at the secondary education level, in both Chile and Germany, between following a Vocational Education with more practical skills, or studying theoretically to later follow a career in a university.

Accordingly, they follow a different curriculum and learn different skills focused on what they are going to need in their future. One big difference between these two countries is that after finishing the Dual Education program in Germany, the graduates can continue their education in their specific careers. Chile on the other hand just offers the possibility to continue one's education at university.

3.1.1. Germany's Lifelong learning policy

In Germany exists a joint strategy between the States (*Länder*) and the central Government for Lifelong Learning (*Strategie für Lebenslanges Lernen in der Bundesrepublik Deutschland*). This is a social agreement that plays a key role for the information and knowledge in today's society.⁵³ This idea that looks to motivate all the students, no matters the type of education they follow, is missing in the Chilean system of education. According to the same source, the strategy is described as:

"The strategy is aimed at demonstrating how learning can be encouraged and supported for all citizens of all ages and at all stages in their lives; this takes place at different locations and teaching is offered in various forms. Lifelong learning includes all formal, non-formal and informal learning. The strategy is oriented around the various phases in a person's life, ranging from early childhood to old age, as well as around key elements for lifelong learning that represent main development focuses."

Therefore, no matter which path the student took, they have the opportunity to continue studying and improve themselves as professionals, which is shown in figure 6.

⁵³ Source: The Education System in the Federal Republic of Germany 2012/1013, A description of the responsibilities, structures and developments in education policy for the exchange of information in Europe (page 24)

This leads to a lot of opportunities for the entire population. People from all age groups can learn a new vocation and continue specializing in it to become a better professional. After the Dual Training for example, people can go to the *Fachschule*, which is a more practical oriented university.

Another country with a similar educational system as Germany is Switzerland. As well as in Germany, Switzerland has a successful Dual Educational system for the vocational education that has made its first attempts to be imported into other countries for their benefits.

An article published in the *Schweizer Revue*⁵⁴ analyzes the success of the Swiss training system. In this article the magazine shows the numbers that back up the success of this education model in Europe.

“...Two thirds of all young Swiss people opt for an apprenticeship over pre-university education spent entirely at a grammar school.”

Just like in Germany, the popularity of the Dual Education in Switzerland reaches two third parts of the young population. According to the same source, this big demand takes place because the country attributes its competitiveness to their well-educated specialists.

“...While well over 60 % of all young people achieve such qualifications⁵⁵ on average in Europe and then go on to enroll at university, the rate only stands at 20 % in Switzerland.”

This low rate of university students is a consequence of the “successful product” that the Dual Education represents. This system is completely integrated in the educational system. It allows every student to go a unique way and guarantees the possibility of further education, regardless of the specialization. This aspect is also considered a key aspect in the German system. The possibility of further education gives the graduates the possibility to grow both professionally and personally.

“...The system does not generate unemployed graduates. While the average rate of unemployment in Europe stands at 10 %, it is 3.3 % in Switzerland.”

⁵⁴ Swiss magazine, Name of the article: How Switzerland exports its pride in craftsmanship. [on line] <http://www.revue.ch/de/ausgaben/2017/01/detail/news/detail/News/wie-die-schweiz-ihren-handwerkerstolz-exportiert/?utm_source=Newsletter12017&utm_medium=E-Mail&utm_campaign=Newsletter12017&cHash=c423769831f313f83616c9207f2352b4>

⁵⁵ The structure of the secondary education in Switzerland is similar to the German one (see point 2.1.3) The students choose in the secondary education if they follow a theoretical path with further education in the university or a practical path with further education through vocational school.

The high reputation of the Swiss' workforce gives the students the possibility of a quick transition from attending school to becoming a specialist of the workforce. In addition, the Dual system gives advantages to the graduates because they already have professional experience.

"A low rate of university entrance qualifications, low youth unemployment and no major shortages of specialist workers – these key points explain why the Swiss model is regarded a paradigm."

In the article "How Switzerland exports its pride in craftsmanship" these key points were mentioned to explain the success of the Swiss system. These points describe the same benefits that Germany has through their system of Dual Education.

"...The economy and training enterprises bear a great responsibility and the state creates the stable legal framework required. Such conditions rarely exist in developing countries in particular."

It is clear that all the participants play an important role in the success of this system. It's also worth to say that this system took over 200 years to reach the status of today. Changes to export this kind of model must be done gradually.

3.1.2. Technical Careers versus University Careers in Chile

In Chile the situation is different. The students who chose to follow a Technical-Professional education can just continue studying by entering to a Technical-Professional institute or a university. The Technical-Professional and the Scientific-Humanistic students are selected according to their score in the *Prueba de Selección Universitaria*⁵⁶, PSU (University Selection Test), but the knowledge measured in this test is theoretical, not practical. This creates a clear disadvantage for the first group of students because in the secondary education they focused on a more practical vocation.

In 2000, a survey was run among the students who finished the Dual Education program about the disadvantages of studying under the Dual Education; their answers are shown in the table 6.

Table 6 - Survey to the graduates from the Dual System

Disadvantage	
Not being prepared enough to continue studying	50%
Lack of time for studying Scientific-Humanistic topics	46%
There were no disadvantages on this type of educational	4%

⁵⁶ The PSU is a set of standardized tests. Its purpose is the selection of postulants for continuing studying in the University or a Technical Institute. [on line]
<<http://psu.demre.cl/la-prueba/que-es-la-psu/caracteristicas-psu>>

system

Source: Evaluación del programa Formación de enseñanza media Técnico Profesional Dual Aplicado en Chile
<http://empresas.sence.cl/documentos/estudios/EstudioEvalProgDUAL.pdf> (page 23)

The two main disadvantages perceived by the students, are related with the continuation of their studies. By choosing to enter the Dual Education program half of them felt a disadvantage for entering to the university or Technical-Professional Institute and continuing their formation. This can be seen in figure 5.

This is in general a reality for all the students who follow the Technical-Professional education, not only the students under the Dual System. Figure 17 shows a graphic of the rate of the average scores (between mathematics and language) over 475 points⁵⁷ in the PSU test of the students in the period between 2006 and 2008. The data is distributed according to the modality of the school: Technical-Professional or Scientific-Humanistic.

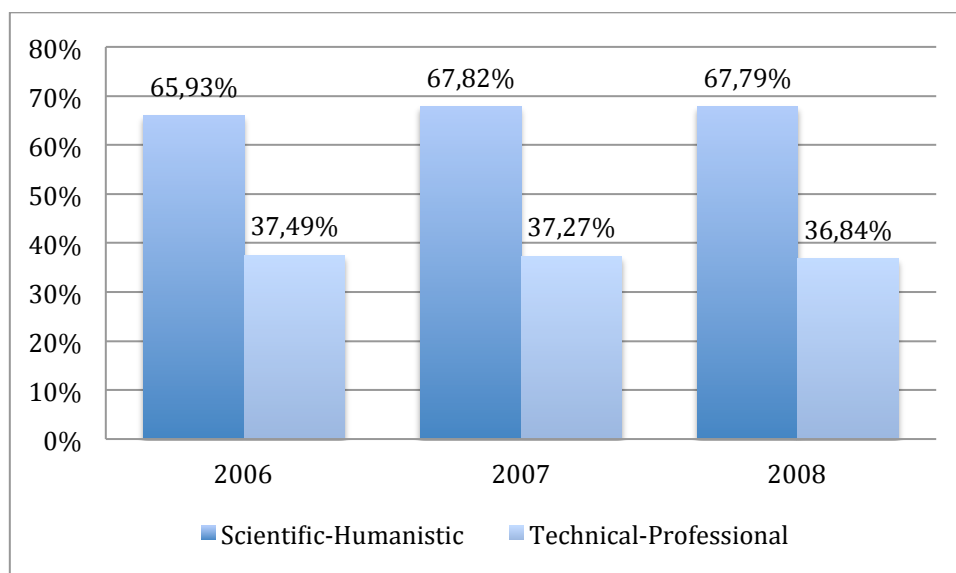


Figure 17 – Rate of average scores over 475 points in the PSU test between 2006 and 2008

Source: “Resultado de rendición de pruebas proceso de admisión 2008” DEMRE-Universidad de Chile, 20 Diciembre 2007

As it can be seen in the figure, twice as many students from the Scientific-Humanistic education modality reach over 475 points in the PSU test than students from the Technical-Professional modality. In addition, according to the same source, in the mathematics’ PSU just 1,5% of the students from the Technical-Professional modality reach scores over 600 points, while 24,2% of the students from Scientific-Humanistic modality do so.

⁵⁷ 475 points is the minimum score required in order to apply to a career

The minimum score for being able to enter a Technical-Professional institute is also lower than the one needed to enter the university. The reason is clear; the necessary skills to study a university career are directly related with the skills measured in the PSU. Therefore, the scores of the students who enter the university compared with the Technical-Professional Institute are higher. This generates a negative impact in the Chilean society because it implies that the Technical-Education is a second-class education.

The Chilean politician Sergio Bitar⁵⁸ talked about the next educational reform that will start being discussed in 2016. Referring to the global situation, he said:

“... En el campo de los acuerdos de desarrollo sustentable va a venir una aceleración para adaptar tecnologías y formas de consumo, y eso tiene implicaciones sobre la estructura productiva y la formación técnica.”⁵⁹

“In the field of sustainable growth, there will come an acceleration to adapt technologies and ways of consume, and this has effects on the productive structure and the technical formation”

Therefore, in the future the productive structure will have to be remodeled and the quality of the technical education needs to improve. This could be done by educating, capacitating and training the workforce in a better way. The politician Bitar also said in his declaration:

“... Hay una necesidad de definir bien qué es esta formación técnica, cómo darle un perfil propio, dignidad propia y no como educación de segunda categoría. Hay que hacer una transición a un sistema propio, regulado, que tenga un impacto importante en los objetivos estratégicos del país: inclusión y productividad.”⁶⁰

“There is a necessity to define well what this technical formation is, how to give it its own profile and dignity, not as a second category education. A transition to a unique regulated system must be done, one that has a significant impact on the strategic objectives of the country: integration and productivity.”

⁵⁸ Sergio Bitar is a Chilean politician, president of the council for progress and strategy. He runs the project “*Tendencias Mundiales y el Futuro de América Latina*” in the interamerican dialogue. He is member of the council of the Universidad de Chile representing Chile’s president.

⁵⁹ Source: <http://www.uchile.cl/noticias/118668/diversidad-y-formacion-tecnica-entran-al-debate-educacional>

⁶⁰ Source: <http://www.uchile.cl/noticias/118668/diversidad-y-formacion-tecnica-entran-al-debate-educacional>

The current basic regulation of the Chilean educational system needs to be restructured. It is necessary to offer the people that follow the Technical-Professional education the opportunity to continue growing professionally and personally. This should be done creating a unique system apart from the existing university system, giving them their own identity.

Politics understand the need to change the image of the system in order to improve the quality of the Technical education. These changes need to make sure that the Technical-Professional education becomes an attractive option that is available for everyone.

This problem can be illustrated in figure 5. Chile's educational system just offers the option to continue the education through a university. Graduates from technical studies don't have the possibility to improve as technical professionals. Their only step forward is to get a university degree.

Other experts in that area also agree on the lack of an own identity of the Technical education. An article published by *El Mercurio's* newspaper on May 22th⁶¹ talks about the current situation of the Technical Education. In it, experts agree on the lack of a unique identity of the technical education and how the system itself encourages students to follow university studies over the technical education. A new educational reform gives the opportunity of free university education to the population but doesn't include the Technical Education. This has the consequence that a great majority of students will choose a university education over a technical one.

Another interesting quote in this article makes reference to the imbalance existing between engineers and technicians:

"De todas las lecturas de la reforma de educación superior, la educación técnica es la gran ausente; el país necesita no solo buenos ingenieros, sino principalmente técnicos. Nuestro equilibrio en este aspecto está muy desbalanceado y seguirá así si no se pone real interés", explica el académico⁶², aludiendo a la falta de 200 mil profesionales del área que se estima tendrá el país en los próximos cinco años.⁶³

"Of all the lectures for the educational reform, the technical education is the big absent; the country doesn't just need good engineers, but mainly

⁶¹ *El Mercurio's* newspaper, p.11 [on line]

<<http://impresa.elmercurio.com/Pages/NewsDetail.aspx?dt=2016-05-22&dtB=22-05-2016 0:00:00&PaginaId=11&bodyid=1>> [consultation: November 2016]

⁶² Santiago Geywitz, docente del Departamento de Diseño y Manufactura de la Universidad Técnica Federico Santa María en Viña del Mar y parte del equipo de Mejora la Técnica (Santiago Geywitz, professor of the Design and manufacture department of the Universidad Técnica Federico Santa María in Viña del Mar and part of the team *Mejora la técnica*).

⁶³ *El Mercurio's* newspaper, p.11. [on line]

<<http://impresa.elmercurio.com/Pages/NewsDetail.aspx?dt=2016-05-22&dtB=22-05-2016 0:00:00&PaginaId=11&bodyid=1>> [consultation November 2016]

good technicians. Our balance in this subject is very unequal and will continue that way if there is not a real interest”, explains the academic, alluding to the estimated lack of 200.000 professionals in the area in the country in the next five years.”

Therefore the necessity of a major change in the vocational system is clear. It is necessary to give value to the technical education and make it an attractive and interesting option for people who choose this education path focused on practical knowledge.

3.2. Modifications of the Chilean Dual System of Education based on the German Model

As it has become apparent, by integrating a new institution in charge and making some alterations in the structure, the present Dual Educational System in Chile could be enhanced. This chapter presents modifications that are based on some key element of the German program shown in section 2.4. to upgrade the quality of the graduate student's education by ensuring a minimum of practical knowledge on the skills and competences a professional in their field must handle. To illustrate the changes, the model is shown in figure 18. There are five key modifications: (1) The creation of an entity who would care and regulate the Dual System, (2) the creation of a second Curriculum with the topics the students must learn while they work in a company, (3) a change in the Performance Plan, that the company creates based on the second Curriculum, (4) the creation of seminars to complement the missing topics in the Performance Plan and (5) the addition of a practical test to measure the skills expected from a student at the end of the process and the participation of the mentioned entity in the final evaluation.

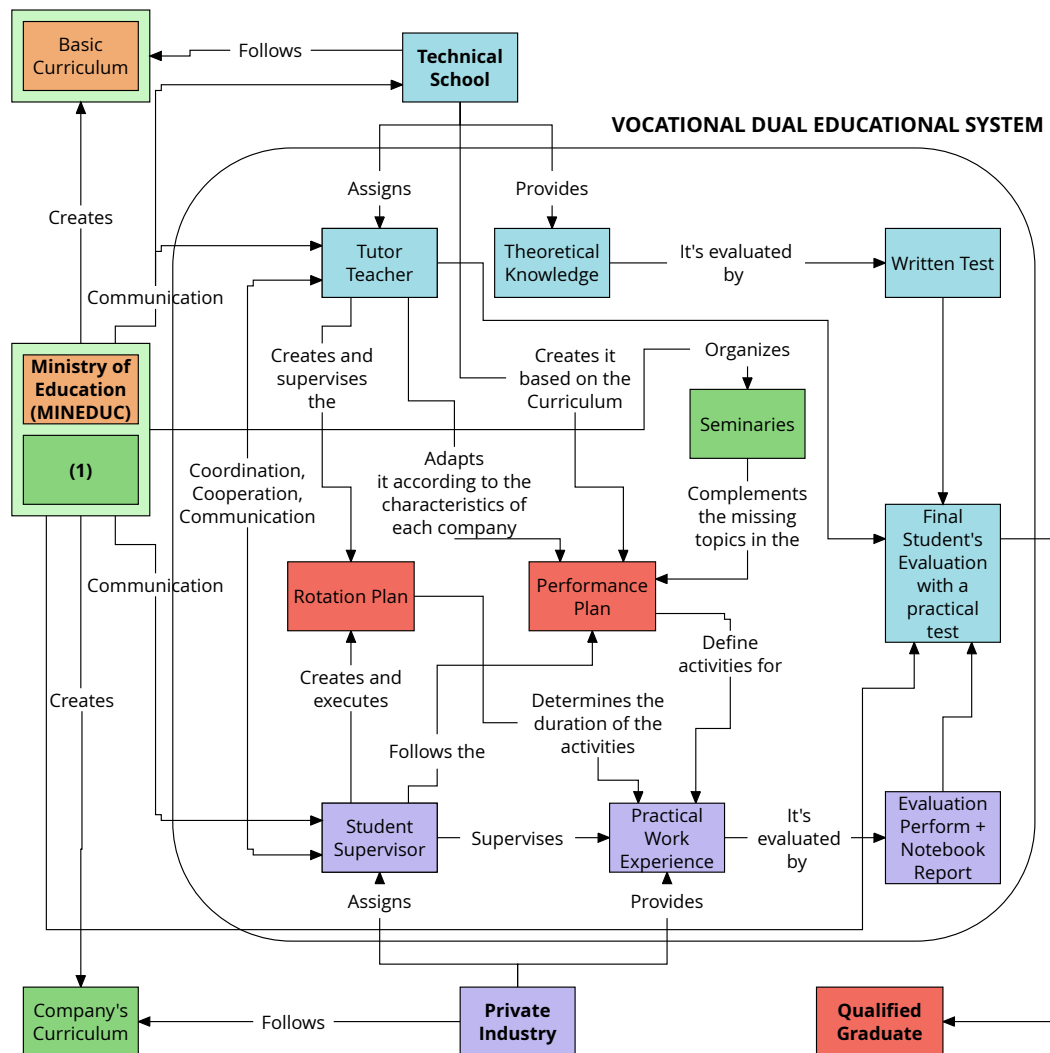


Figure 18 – Modified model of the Dual System of Vocational Education

3.2.1. The Cornerstone for the Dual Model

At the moment, the Curriculum of the careers only has recommendations on how to implement the Dual Education into the Technical Schools. A deeper work should be done to define in detail how to implement the Dual Education in a homogeneous way in all the schools on a national level. The creation of a new entity that cares and controls the Dual Education could be an answer to this problem. This new entity and its participation in the Dual System are shown in green in figure 18.

This entity should have the representation and participation of a competent and involved organism. Therefore, it would be advisable that this entity should be formed by the Chilean Ministry of Education (MINEDUC). In addition, it should also have a representative from: (1) the Technical School,

(2) the companies and (3) a specialist in the specific area, which in this case would be construction. The participation of these entities would help to know where the program is weak and where it needs to change.

Some of the main duties of the new entity should be to care for the design and to update the Curriculum for the Technical Schools and for the companies for each career. In addition, the new entity would also be in charge of organizing seminars to complement the missing topics in the Performance Plan. This is discussed ahead under point 3.2.

Currently, the schools are in charge of holding a place for each registered student on the program. The new entity should cooperate with the Technical Schools and with the companies for filling up the vacancies in the companies. This would help filling the apprentices' vacancies in all companies and ensure a training place for all students nationwide.

The new entity should also be in charge of regulating, approving and monitoring the companies that participate in the Dual System to ensure the satisfaction of all basic requirements.

A representative from the Technical Schools and the Companies in the new entity would help the new authority work these issues.

3.2.2. The Curriculums and the addition of Seminars

Figure 18 shows that the new entity is not only responsible for creating a new Curriculum for the Technical School. It's also in charge of the Curriculum for the Company, as discussed under point 4.3. The new authority will be in charge of defining the necessary topics the apprentices need to learn during their time working in the company. This means that there would be the same plan for all the Technical Schools and the companies, bringing homogeneity to the system nationwide.

Another big change is that now the company is in charge of deciding which topics they teach to the apprentices based on the Company's Curriculum. The Performance Plan created by each company must be approved by the new entity before it can be used. This way the creation of insufficient or inadequate Performance Plans is avoided.

Demanding that all companies teach the exact same topics as stipulated in the company's Curriculum comes with difficulties. This can be due to many reasons: Due to differences in size and specialty of the companies, some companies cannot teach their apprentices to perform special tasks. It can also happen that during the period of time when the student worked at the company, he could not participate in some activities, because these were already taught by the time he started working (e.g. the set-up of the construction site just takes place once at the beginning of the project).

For these reasons the new system includes the organization of specific seminars for the apprentices. The seminars have the purpose of complementing the missing topics on the Performance Plan. The purpose of the seminars is to prepare all the apprentices nationwide with the same level of knowledge - independently of the company or school they attend.

3.2.3. A model for a Company's Lead Curriculum

The Company's Curriculum defines the knowledge and skills that the apprentice is expected to learn by the end of his time working in a company. With this purpose on mind, the company must design a Performance Plan with processes where the trainee can acquire the knowledge defined in the Curriculum during his training.

The German Curriculum for the building construction area (Hochbaufacharbeit) under the Dual System of Vocational Education, which is discussed under point 2.4.1, was taken as a base to create a model for a Chilean company's Curriculum.

The specialty that was selected for analyzing the second and third year is Beton- und Stahlbetonbauer (Concrete, reinforced iron and rebar worker), which is the most comparable with the existing vocational careers in Chile.

Based on Germany's Curriculum for the Building Construction Workers under the Dual System of Vocational Education, a new Curriculum for the Technical-Professional formation under the Dual System in Chile will be designed for the following careers: Técnico del nivel medio de la construcción mención Edificación (Technician of secondary level in the construction area with major in building constructions) and Técnico del nivel medio de la construcción mención Terminaciones de la construcción (Technician of secondary level in the construction area with major in completion in construction).

In the current Curriculum for the Technical Schools in Chile's as well as in Germany's system, the first year is the same for all the vocations in the construction area. Table 7 shows a modification for the modules of the new company's Curriculum for the first year of training in the Chilean Dual system. A detailed description of each module is shown in the index B.

To define the topics in this Curriculum topics of the current Curriculum of the Technical Schools were taken and selected topics from Germany's Curriculum into consideration. The new company's Curriculum that is shown in table 7 has the objective of complementing the knowledge imparted in the Technical School to give the apprentice a versatile practical experience in his vocation.

Table 7 – Company’s Curriculum, First Year

Nr.	Module
1	Vocational Education, labor and collective bargaining
2	Structure and organization of the training company
3	Safety and health protection at work
4	Environmental protection
5	Assumption of orders, activity recording, work plan and time schedule
6	Set-up, safeguarding and clearing the construction site
7	Testing, storing and choosing construction- and auxiliary materials
8	Reading and interpretation of plans
9	Measuring
10	Carpentry for setting up the construction site

As well as in Germany’s guidelines, the modules one to four should be included from the beginning to the end of the apprentice’s first year of training. This is due to: (1) The importance for the trainee to know how the labor world works in order to positively integrate (module one and two), (2) the importance of safety and health of the workers at any time (module three) and (3) to create conscience in the workers about the environmental protection (module four).

The rest of the modules are knowledge and skills that can be imparted together with other activities directly on the construction site. The length of these modules should be around five to six weeks depending on the criteria of the company at the moment of creating the Performance Plan, which has to be approved by the new entity before its implementation.

The modules that the specific company cannot impart completely should be complemented or taught entirely to the apprentices in the seminars organized by the new entity.

After the first year of training the apprentices must choose a major he wants to follow. The Company’s Curriculums for both mentioned majors are shown under the following points 3.2.3.1 and 3.2.3.2. For their design the actual topics of the Chilean system complemented by the German one were taken into consideration.

3.2.3.1. Major in building constructions

The modules of this major defined in the Technical School’s Curriculum are shown in the table 8. The description of each module is shown in the annex D.

Table 8 - Modules of the major in building construction, second year

Nr.	Name of the module
1	<i>Albañilerías estructurales y no estructurales</i> (Structural and no structural masonry)
2	<i>Carpintería estructural</i> (Structural carpentry)
3	<i>Enfierradura para elementos estructurales</i> (Steel reinforcement for structural elements)
4	<i>Estructuras de hormigón</i> (Concrete structures)
5	<i>Emprendimiento y empleabilidad</i> (Starting and employability)

Taking these topics into consideration, a Company's Curriculum was designed based on the German Curriculum for the career of Concrete, reinforced iron and rebar worker. This is shown in table 9. A detailed description of each module is shown in the annex C. This curriculum helps complementing the topics taught at the institutes and gives the student practical experience.

Table 9 - Company's Curriculum for the Major in building construction, second year

Nr.	Module
1	Structural and no structural masonry
2	Production and installation of drywall elements
3	Structural carpentry
4	Steel reinforcement for structural elements out of concrete
5	Concrete structures
6	Maintenance and renovation of concrete and reinforcement concrete

3.2.3.2. Major in completions in construction

The modules of this major defined in the Technical School's Curriculum are shown in the table 10. The description of each module is shown in the annex A.

Table 10 –Modules of the major in completions in construction, second year

Nr.	Name of the module
1	<i>Impermeabilización y aislación de elementos</i> (Sealing and isolation of elements)
2	<i>Instalación de cubiertas y elementos de evacuación de aguas lluvias</i> (Installation of toppings and elements for the moving of rainwater)
3	<i>Instalación de muebles, puertas y ventanas</i> (Installation of furniture, doors and windows)
4	<i>Revestimiento para pisos, muros y cielos</i> (Revetment for floors, walls and ceiling)
5	<i>Emprendimiento y empleabilidad</i> (Starting and employability)

Taking these topics into consideration, a Company's Curriculum was designed based in the German Curriculum for the career of Concrete, reinforced iron and rebar worker. This is shown and described in the table 11. A detailed description of each module is shown in the annex C. This Curriculum helps complementing the topics taught at the Institutes and gives the student practical experience.

Table 11 - Company's Curriculum for the Major in Completions in Construction, Second Year

Nr.	Module
1	Sealing and isolation of elements
2	Production and installation of drywall elements
3	Installation of furniture, doors and windows
4	Revetment for floors, walls and ceilings
5	To install rainwater evacuation elements

3.2.4. Evaluation

As explained in the previous point, at the moment all the schools under the Dual System for the Vocational Education have different Performance Plans for the topics that the apprentices must learn at the companies. This implies that students that attend different schools can face different evaluation criteria. This can also create disadvantages between students with the same major but with different levels of practical knowledge in their specialty due to these differences in their Performance Plans.

By creating a Company's Curriculum for the Performance Plan and complementing it with the seminars this problem is reduced. However, there is still a problem in the system concerning the evaluation of the practical knowledge of the apprentices.

At the moment, the time the student spends in the companies must be monitored based on: (1) the evaluation of the Student Supervisor and (2) the evaluation of the Tutor Teacher in charge of the student and (3) the notebook report that works as a logbook. Here, the apprentice details his performed activities and how to do them correctly.

Based on Germany's Vocational System of Education a practical test should be added at the end of the training. This would have the aim of measuring the practical skills and knowledge of the apprentice while he performs an activity.

The Final examination

The objective of the final examination is to assess the level of skills and knowledge that the apprentice has gained at the end of his formation. The level that is expected for passing the final exam, of course, will dictate the quality of the graduates when they enter the workforce in Chile. Thus, the definition and the maintenance of the passing performance will be most critical and decisive for the long-term success of the system. As it will be discussed below, in order to create a feedback-loop into the system, two follow-up reviews of performances by students should be done two and five years after graduation. Failing students may have to take more classes before they can retake the examination.

The final examination should measure knowledge and skills described in the Company's Performance Plan in table 7 under point 3.2.3, table 9 from the point 3.2.3.1 and table 11 from the point 3.2.3.2 that he learns during his time working at the company.

In this examination the apprentice should perform a practical task within a defined time. During this time he should: show that he is capable to plan the different steps of the process, show that he knows which materials and tools to use, show how to keep the workplace safe, consider adequate health conditions and justify orally or written the reason of his answers.

For the final examination, the different areas of the practical task should be defined within the regulations by the entity responsible for the Dual Education. Areas that could be considered for the practical examination for the vocational careers under study are shown in the table 12 and 13.

Table 12 – Examination areas for the Technical career in construction with major in building constructions

Nr.	Area
1	To make a wall in right angle with bricks preparing the mortar with the correct doze
2	To make a wooden framework for a rectangular peace of reinforced concrete like a fundament or a column
3	To make and put on position reinforcement for a rectangular structure like a column or fundaments
4	To prepare concrete with a proper doze and measure workability. To Cast the concrete in a wooden framework and compact it

properly

Table 13 – Examination areas for the Technical career in construction with major in completions in construction

Nr.	Area
1	To make plaster in a correct doze and apply it to a wall
2	To build wall partitions, installing a wall and a window in it
3	To prepare and install isolating materials in a wall

4. Analysis of the Current Situation of the Dual System in Chile and Perspective for the Future

To collect more information on the current situation of the technical education in Chile, a survey was run among Technical Schools and companies related to the construction area. With this purpose on mind, the questions of the survey were designed focused on companies and Technical Schools.

The survey was run via Internet using Google Forms. The survey designed for the Technical Schools and companies are shown in the annex E and G respectively. The question form was sent to all the Technical Schools in Chile that are related to the construction area and had a contact email available, regardless of current involvement or noninvolvement of the Technical Schools in the Dual Education System. The directors of the schools, chiefs in charge of the educational plans for the technical education, as well as professors answered the survey. The total answers received were 62 valid responses. The results are exposed in the annex F.

The survey was sent to companies who are related to structural work in the construction area with an available contact email. Managers, Engineers and risk prevention workers answered the survey. The total answers received were 54 valid responses. The results are exposed in the annex H.

The main goal of the survey was to establish and measure what kind of benefits implementing this new system in Chile could bring. The questions are designed to measure the improvements in quality and safety in the construction area by having a more qualified staff working on the construction site.

Unlike the Technical Schools that answered the survey, the other group doesn't know what the Dual System is and how it works. The figures 19 and 20 show the answers from both groups to the question: 'Do you know the Dual System?'

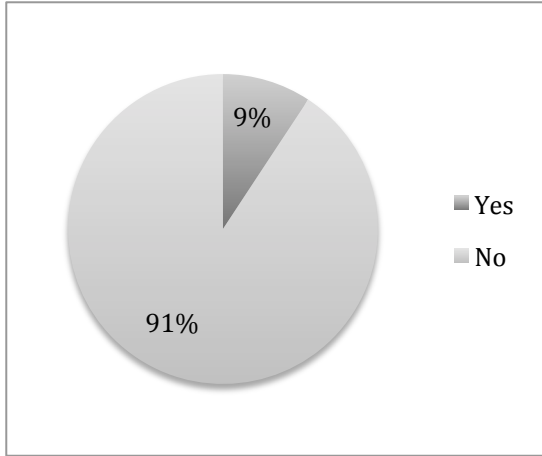


Figure 19 - Answers of the Technical School's staff to question 3: Do you know the Dual System?

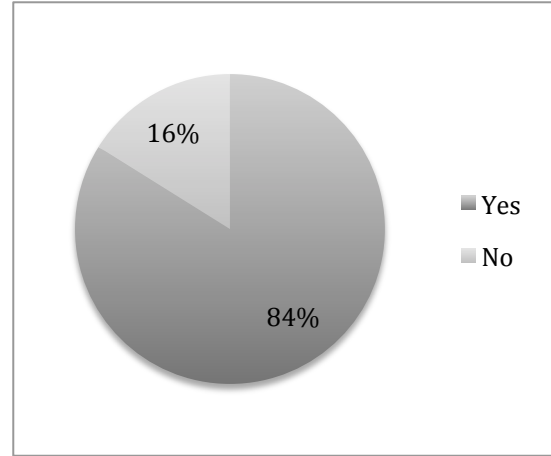


Figure 20 - Answers of the company's staff to question 3: Do you know the Dual System?

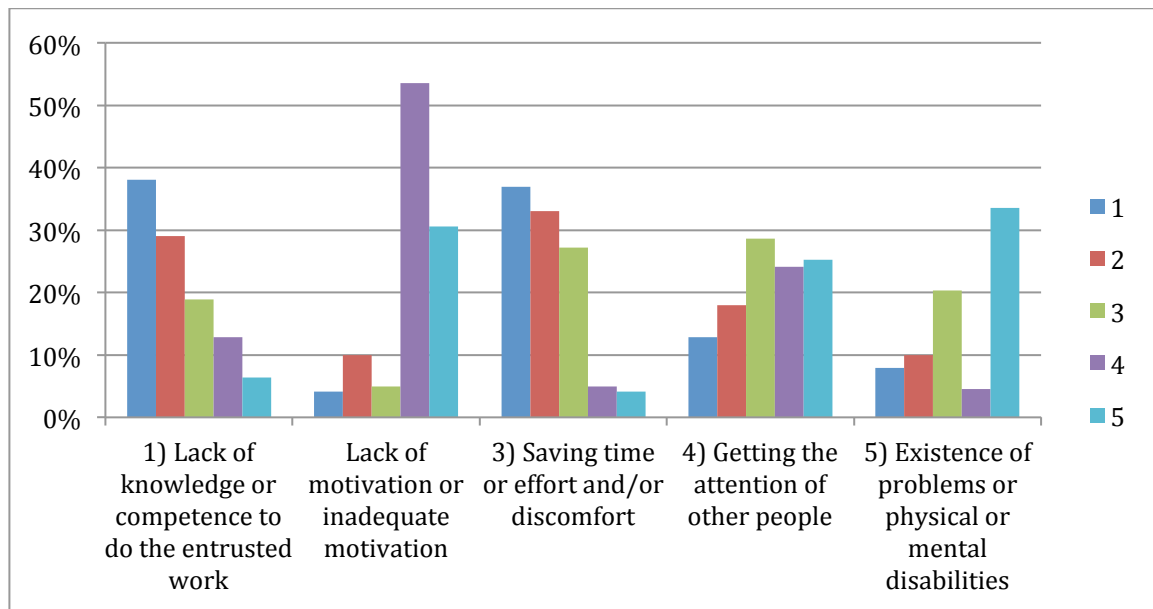


Figure 19 – Answers of the Technical School's staff to question 6: Order the following factors in accordance with its implication in labor accidents. 1 implies very often and 5 not often

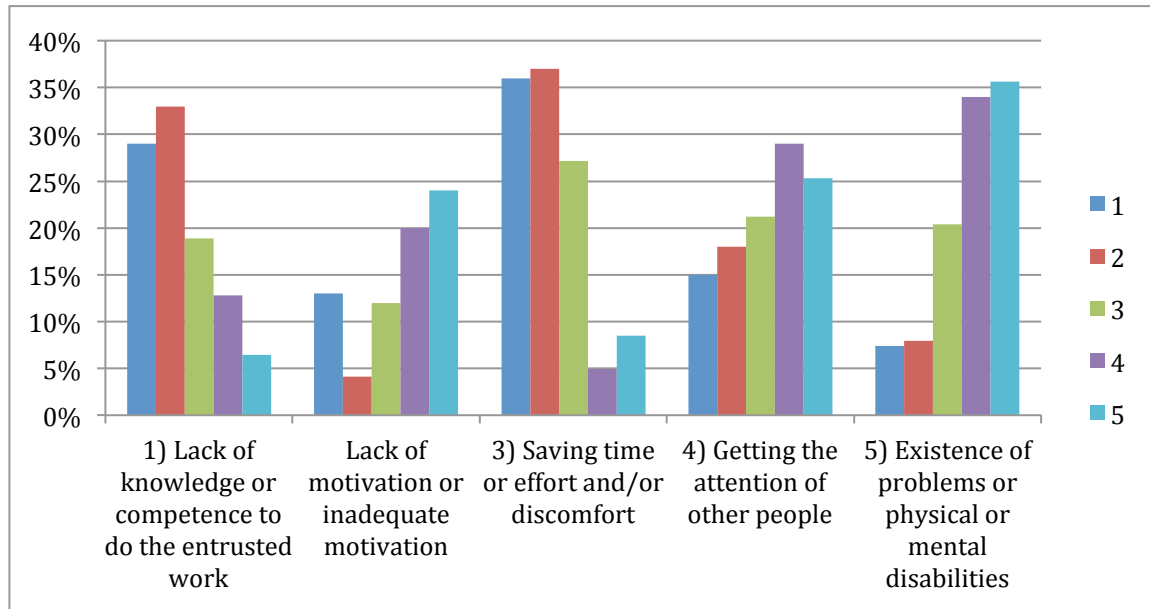


Figure 22 – Response Distribution to question 6: Please order the following factors in accordance with its implication in labor accidents. 1 implies very often and 5 not often

The dirección del trabajo in Chile (Chilean Department of Labor) defines five main human factors that cause accidents at work in Chile, which were shown in table 1. Both groups, companies and Technical Schools, were asked to put these five factors in order depending on how often the accidents are related to each factor. The answers are shown in the figures 21 and 22.

As it can be seen in the previous figures, all the respondents from both groups agree that the biggest factors of accidents are: (1) Lack of knowledge and (2) trying to save time and inconvenience. Having a poorly educated workforce therefore was mentioned as being the main reason for accidents on the construction site. On that account, a good training for construction workers could be considered as a perspective to decrease occupational accidents.

Both groups also agreed that the factor that is the least related to industrial injuries is the existence of a disability (physical or mental). This particular factor has no definite impact on a worker's knowledge or attitude. However, this factor is mentioned by the Chilean Labor Department for having an impact if the worker doesn't know his own limits and doesn't realize when he needs help.

For a company to have more qualified working staff, it has to pay higher salaries to its employees. This doesn't imply the company having less profit in the end. If anything, it's quite the opposite. Due to the improved quality of the finished work the firm will have a bigger benefit and the company will save money on wasted time and materials during the construction process, which could be due to errors and therefore accidents of the workers.

The staff of Technical Schools and Companies was asked about their opinion on a hypothetical situation of raising the salaries in exchange for more qualified construction staff. The answers from both groups are shown in the figures 23 and 24 respectively.

The figures 23 and 24 show that the majority from both groups would be willing to pay higher salaries in exchange for more qualified working personnel. This shows a clear dissatisfaction from the participants of the survey with the current situation in Chile. This shows that both companies and Technical Schools would be willing to take the adaption of a new training system, like the Dual Educational system, into consideration.

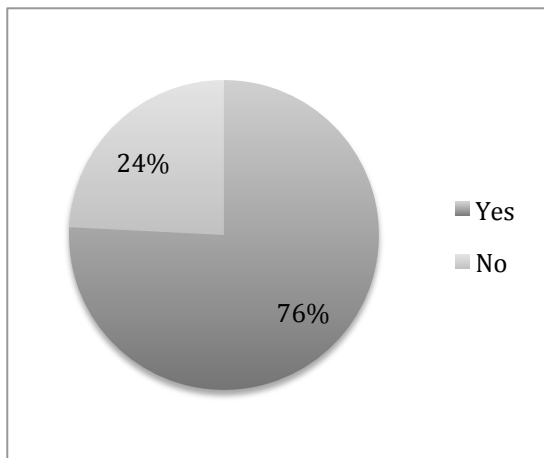


Figure 23 - Answers of Technical School's staff to question 12: Do you think that the companies would be willing to pay bigger salaries for better qualified personnel that guarantees better quality standards?

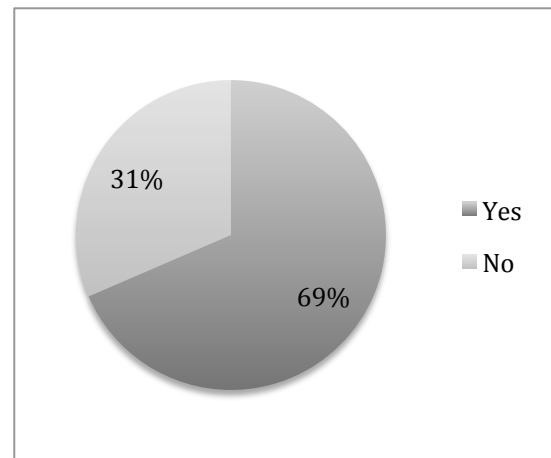


Figure 24 - Answers of Company's staff to question 12: Would you be willing to pay bigger salaries for better qualified personnel that guarantees better quality standards?

In the surveys the staff from the Technical Schools and the companies were asked if the quality of the construction works and the safety on the construction sites could be improved if the working personnel would be better prepared, i.e. if all the working staff would be educated and/or trained for working in the construction area (questions eight and nine from both surveys).

A big majority from both groups answered these two questions positively. 90% from the Technical School's staff agrees that the quality of the construction works would improve by having personnel educated in technical careers or through training courses in the construction area. 92% of the same group also thinks that the safety on the construction sites would be higher if all workers would be qualified with training in the construction area.

The analysis of the answers of the second group shows that the company's staff agrees with the first group. 81% think that the quality of the construction works would be higher if the workers of the company would be educated with technical careers or

training courses in the construction area. 85% also think that the safety in the construction site would be better if all the workers would be well prepared with training in the construction area.

How it was discussed previously in the chapter 2, the Dual System comes with many benefits for the students of Technical Schools and for the schools themselves. One of these benefits is mentioned the point 2.5.1. The Technical Schools save money on investment and maintenance of equipment. The company provides the necessary infrastructure for the student during his training. This gives the student the opportunity of learning with cutting edge technology and techniques. Therefore this system benefits both, the Technical Schools and the students.

In Germany, where this system is already established, it is designed to benefit all their participants, leading to a high adaptation rate in the country. The main reasons why companies choose to take part in the Dual Educational System is shown in the Table 5 and discussed under point 2.5.2.

The question ten of the survey explains how the Dual System of Education works and asks both groups if this system could be attractive for the private sector. The answers show that 81% of the Technical School's staff and 79% of company's staff think that it is attractive. This shows that this system is an interesting opportunity for both sides of participants.

Question eleven shows an interesting fact: Both groups were asked if they would be willing to work together with the government to regulate and organize the system. While in the group of the Technical Schools 85% would be interested, only 48% of the company's staff would be willing to work together with Technical Schools and the government.

This shows that the government has a negative image from the private sector's point of view. This could be a problem due that fact that the private sector is the backbone that finances most of this system.

Conclusions

This thesis studied the problem of the lack of trained staff in the construction sites in Chile. Training Chilean construction workers under a system similar to the German Dual System of education could be a good solution to improve this situation.

In Chile the average of fatal accidents in the construction area per year is 95.4 people, which equals 20% of the total number of fatal accidents at work in the entire country (482.7 deaths)⁶⁴. To this situation we add the fact that less than 65% of the workers have not received any type of professional training on the tasks they perform during their work⁶⁵. It is not wrong to think that these two facts could be related between them.

The Dual System of Vocational Education, that is a training option for construction workers, in Chile has been analyzed. A system to improve the current Dual system was presented followed by an analysis on its potential impact through a survey between the involved parts.

These modifications are based on the German system for vocational Education, particularly, the modality of Dual Education. This work pursues to improve the Chilean system while taking into consideration the educational, economic and social differences between the two countries. This is an option to provide the construction area with qualified workforce and give an opportunity to the workforce in this area, the opportunity of a proper vocational career.

In Germany the average number of total fatal accidents in the country in the same lapse of time was 224,7⁶⁶. This number is less than the half compared to Chilean statistics, with the difference that Germany is a country with five times more inhabitants than Chile⁶⁷. In addition, just 18% of the workforce in Germany has no formal education. The correlation between the number of fatal accidents and the level of education or training of the workforce is evident. The numbers in Chile are alarming and a change is needed fast.

The Chapter two (Theoretical Framework) shows a background of both Chile's and Germany's systems, and how the Dual Education works in each country.

The first big difference between the two countries is that the Vocational Education in Chile doesn't have an own and respected identity. This type of education is seen as a path for the students that didn't get the grades to enter a university or couldn't afford it, instead of being an interesting and a good option for the future. In countries like

⁶⁴ Data corresponding to the period between 2007 and 2013. *Departamento de Estadísticas e Información de Salud*, <http://www.deis.cl/estadisticas-laborales/>

⁶⁵ *Cámara Chilena de la Construcción (CCHC)*

⁶⁶ *Bundesanstalt für Arbeitsschutz und Arbeitsmedizin*, excluding the mining and public transportation

⁶⁷ Population of Germany: 82.175.884 inhabitants. *Statistische Ämter des Bundes und der Länder*, 31 Dezember 2015

Germany and Switzerland, who have a recognized vocational education system, many young people choose the vocational education over university studies⁶⁸. This is due to the fact that the vocational education in those countries offers them the opportunity to continue to continue growing professionally through further education to become a successful specialist.

The differences between the vocational education in Chile and in Germany start with the big differences between the structures of both educational systems. On one side, in Germany the students at the beginning of the secondary education are divided in different schools depending on the direction they are going to follow (vocational or theoretical). On the other side, in Chile the secondary education is focused on providing the students with the necessary knowledge for entering the university. Furthermore, the individuals that choose the Vocational Education path have no possibility of perfecting their knowledge further. Both systems are illustrated in the figures five and six under point 2.2 where both systems are described in detail.

In chapter three the current situation for the Dual modality for the vocational education in Chile is schematized and analyzed. This modality was included into the existing educational system without making a change of the educational structure in some Technical Schools. The rules for the Technical School in order to implement this modality are also very open, giving the schools many liberties on how to teach and evaluate the students. The disadvantage is that on the other hand it doesn't provide a general concept.

This reduces the chances of having the same quality standards as the German system. There are problems of inhomogeneity because the final knowledge and the competences of the apprentices at the end of the training will vary depending on the Technical School he attends.

In order to implement the dual modality effectively, mayor changes need to be done in the structure of the Vocational Education System. A new organization for the vocational education is developed in the chapter three and illustrated in figure 18.

The main changes were: (1) the creation of an entity composed by representatives from the three groups (private sector, Technical Schools and the government). Its duty is to define, organize and regulate the Dual Education. (2) The creation and regulation of the contents of the Curriculum for the apprentice in companies and in the Technical Schools. This would reduce missing topics that the graduates learn "on the road" when they start working. This new entity can discuss and select which modules should be taught in the school and which ones at the company, regarding the fact that some topics can't be taught properly in the classroom. (3) The creation of seminars to complement missing topics in the modules that cannot be taught due to a lack of e.g. specialization of a specific company. (4) And the creation of a practical test at the end to ensure the quality of the apprentice's competences.

These changes could pursue to give the system homogeneity in the quality of the students nationwide. It also improves the quality of the training of students from schools with insufficient infrastructure, establishing a minimum of quality.

⁶⁸ Point 2.5.1

The goal for the future must be to continue improving the Curriculum for the technical careers and to divide them in careers specialized in a specific area. This would improve the profile of the graduates and their professional competences, giving the option to continue improving their skills.

The graduates from the vocational careers under de dual modality need a new profile. It must show how qualified they are in their area. They have the necessary working experience to integrate efficiency in construction work.

Finally a survey was run between two important groups that take action in the Dual Education: the staff from the Technical Schools and the companies. The questions were adapted to both groups and are show in the annexes E and G. The results were discussed in the chapter five of assessment on potential impact.

It is necessary to have in consideration that the results of the survey are limited because of the size of the sample (62 answers for the first group and 54 for the second), but a clear trend could be recognized in both of them through the analysis of their answers.

The survey showed that this system is still unknown in the private sector as just 9% heard about the Dual System of Education. However, after an explanation of the composition and the function of the system, 79% of the respondents would be interested in participating in it.

Although this system is an interesting option and has benefits for both sides of participants, there is a significant uncertainty of the private sector about the concept of working altogether with the government. This shows the importance of an arbitrary entity to establish a frame concept that is binding for all sides.

The survey also showed that both sectors think that the quality of the final works and the safety in the construction site could be improved by having better trained and qualified personnel.

Accidents and errors due to an untrained workforce cause a big part of the time and monetary losses on construction sites for the private sector. It suggests that the numbers of untrained personnel in the construction's workforce in Chile needs to be reduced in order to prevent these losses. Considering the generally positive attitude received from the questioned companies and Technical Schools towards the Dual Educational system, it should be possible to change the current situation gradually by giving an attractive opportunity to individuals that want to start a vocation in the construction area.

This could be done through the gradual implementation of the Dual System of Vocational Education, since the private sector helps financing the training of the students, benefiting both the students and the companies themselves.

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Annexes

Annex A - Curriculum for the technical careers in Chile with majors in building constructor and completions in construction⁶⁹

PLAN DE ESTUDIO DE LA ESPECIALIDAD CONSTRUCCIÓN, MENCIÓN EDIFICACIÓN

NOMBRE DEL MÓDULO	TERCERO MEDIO	CUARTO MEDIO
	Duración (horas)	Duración (horas)
1. Análisis de muestras de hormigón, suelos y materiales	152	
2. Carpintería de instalación de faenas	152	
3. Control y mantenimiento de bodegas y paños	76	
4. Cubicación de materiales e insumos	76	
5. Interpretación de planos de construcción	152	
6. Prevención de riesgos en la construcción	76	
7. Trazado de obras de construcción	152	
Módulos de la mención		
1. Albañilerías estructurales y no estructurales		152
2. Carpintería estructural		228
3. Enfierradura para elementos estructurales		152
4. Estructuras de hormigón		228
5. Emprendimiento y empleabilidad		76
TOTAL	836	836

⁶⁹ Source: Programa de estudio, formación Diferenciada Técnico-Profesional, Especialidad Construcción

ESPECIALIDAD CONSTRUCCIÓN, MENCIÓN TERMINACIONES DE LA CONSTRUCCIÓN

NOMBRE DEL MÓDULO	TERCERO MEDIO	CUARTO MEDIO
	Duración (horas)	Duración (horas)
1. Análisis de muestras de hormigón, suelos y materiales	152	
2. Carpintería de instalación de faenas	152	
3. Control y mantenimiento de bodegas y pañoles	76	
4. Cubicación de materiales e insumos	76	
5. Interpretación de planos de construcción	152	
6. Prevención de riesgos en la construcción	76	
7. Trazado de obras de construcción	152	
Módulos de la mención		
1. Impermeabilización y aislación de elementos		152
2. Instalación de cubiertas y elementos de evacuación de aguas lluvias		152
3. Instalación de muebles, puertas y ventanas		228
4. Revestimientos para pisos, muros y cielos		228
5. Emprendimiento y empleabilidad		76
TOTAL	836	836

Annex B – Company’s Curriculum, First Year

Nr.	Module	Skills and knowledge to be imparted
1	Vocational Education, labor and collective bargaining	a) To understand the meaning of the training contract, including the final examination. b) To know the rights and duties of the trainee on the training contract c) To mention the further possibilities of vocational education d) To Mention the essential parts of the training contract e) To mention the essential clauses of the contract of the training company
2	Structure and organization of the training company	a) To explain the structure and tasks of the training company b) To explain the main functions of the training company, like offering, acquisition, manufacture and administration. c) To mention the relation between the training company and its employees; economic organizations, trade associations and labor unions d) To describe the basis tasks and modus operandi of the work constitution or staff council rules organs of the training company
3	Safety and health protection at work	a) To take measures and precautions from the threats on safety and health at the workplace b) To apply occupational worker protection and accident prevention regulations c) To describe behaviors in the event of accidents, like first measures to take in case of an accident d) To apply regulations of the preventive fire control; to describe behaviors of the fire dynamic and to start measures for firefighting
4	Environment protection	To contribute to the prevention of operational pollution and contamination in the area of the worksite, specially: a) To know the possible pollution cases and how to minimize the contamination b) To apply the current regulations for the environment protection c) To know the benefits in the use of economical and environmental friendly energy and materials d) To avoid waste and bring substances and materials to a environmental friendly disposal
5	Assumption of orders, activity recording, work plan and time schedule	a) To recognize the objective of the work order b) To plan steps in the work process, safety measures and the use of the proper work equipment c) To choose the correct construction materials d) To choose the proper construction resources and tools for the task e) To examine completed works based on quality standards f) To prepare work reports
6	Set-up, safeguarding and clearing the construction site	Workplace and construction site: a) To consider an ergonomic installation, maintaining and clearing of the workplace b) To secure the workplace

Nr.	Module	Skills and knowledge to be imparted
		Working and protective scaffolds: c) To construct, maintain and dismantle working and protective scaffolds d) To contribute examining the safety operation of working and protective scaffolds Tools and devices: e) To motivate the order of the supply of tools and devices f) To recognize and report troubles on devices g) To maintain tools
7	Testing, storing and choosing construction- and auxiliary materials	a) To take and prepare samples of concrete, ground and materials using the appropriate equipment b) To check construction and auxiliary materials like prefabricated components, mounting and attachment parts through the applicability of visual inspection c) To check dimensional accuracy of prefabricated components like mounting and attachment parts d) Transporting and storing in the workplace of construction and auxiliary materials, prefabricated components like mounting and attachment parts
8	Reading and interpretation of plans	a) To read and apply drawings and sketches b) To make conducting drawings c) To calculate quantities using drawings and plans
9	To take measurements	a) To make measurements with measuring tape and folding ruler b) To assign heights, specially with bubble level and water level gauge c) To align straight d) To locate and ensure landmarks e) To set up and verify right angles f) To delimit building components
10	Carpentry for setting up the construction site	a) To distinguish different woods regarding their use b) To measure and mark timber for work pieces according to blueprints using the appropriate tools and equipment c) To protect timber pieces from moisture

Annex C – Company's Curriculum for the major in building construction, second year

Nr.	Module	Skills and knowledge to be imparted
1	Structural and no structural masonry	a) To doze mortar for the construction of structural and no structural walls b) To cut and lay bricks and blocks for the construction of walls according to the project's specifications
2	Production and installation of drywall elements	a) To evaluate adhesion, load capacity and correct measurements of the floor b) To pretreat the floor for the improvement of the adhesion and load capacity c) To mix gypsum mortar d) To fill gaps
3	Structural carpentry	a) To build wooden formworks for rectangular fundaments, pillars, walls, beams and gaps to cast concrete on them b) To dismantle, remove nails, clean and store wooden formworks c) To build walls and ceilings according to the specifications d) To know the necessary materials, tools and equipment necessary for the job
4	Steel reinforcement for structural elements out of concrete	a) To organize the previous steps for the job: collect the necessary materials, tools and equipment b) To prepare reinforcements bars for vertical and horizontal structures of concrete by crosscutting, bending and bonding the bars c) To cut steel mats d) To assemble reinforcements with spaces in between
5	Concrete structures	a) To make concretes according to formula and to test it on workability b) To cast, compress, screed and give the follow-up treatment to concrete by hand c) To refinish surfaces d) To transport and mount small prefabricated components of concrete and reinforced concrete e) To check, clean and display mistakes on the underground for the sealing on levelness, dryness and consistence f) To seal concrete and reinforced concrete elements against moisture
6	Maintenance and renovation of concrete and reinforcement concrete	a) To prepare surfaces to derust the reinforcement b) To apply anticorrosive c) To apply adhesive for concrete d) To use mortal for reparations e) To restore surfaces

Annex D – Company’s Curriculum for the Major in Completions in Construction, Second Year

Nr.	Module	Skills and knowledge to be imparted
1	Sealing and isolation of elements	a) To prepare and distinguish sealing materials according to their use b) To install isolating materials on walls, ceilings, ventilation ducts and columns c) To install isolating barriers on the construction site according to the plans and technical specifications, manufacturing specifications and actual regulations
2	Production and installation of drywall elements	a) To evaluate adhesion, load capacity and correct measurements of the floor b) To pretreat the floor for the improvement of the adhesion and load capacity c) To mix gypsum mortar d) To fill gaps
3	Installation of furniture, doors and windows	a) To arm and install furniture according to the specifications of the manufacturer b) To install doors and windows in walls and dry walls
4	Revetment for floors, walls and ceilings	a) To prepare paintings for walls and ceilings b) To paint walls and ceilings considering different surfaces c) To install wallpapers in walls and ceilings d) Production and application of wall and floor plaster
5	To install rainwater evacuation elements	a) To install elements and accessories for the evacuation of rainwater b) To take the proper safety measures for working in height

Annex E – Survey 1 (for Technical Schools)

Introducción

El 2013 en Chile el departamento de estadística registró 467 accidentes fatales de los cuales el 25% correspondieron al área de la construcción. En el gráfico adjunto se puede apreciar que el mismo escenario se repite cada año. Además, la cámara Chilena de la construcción afirma que el 64% de los obreros de la construcción no ha recibido ningún tipo de capacitación. ¿Cree usted que estos hechos estén correlacionados?

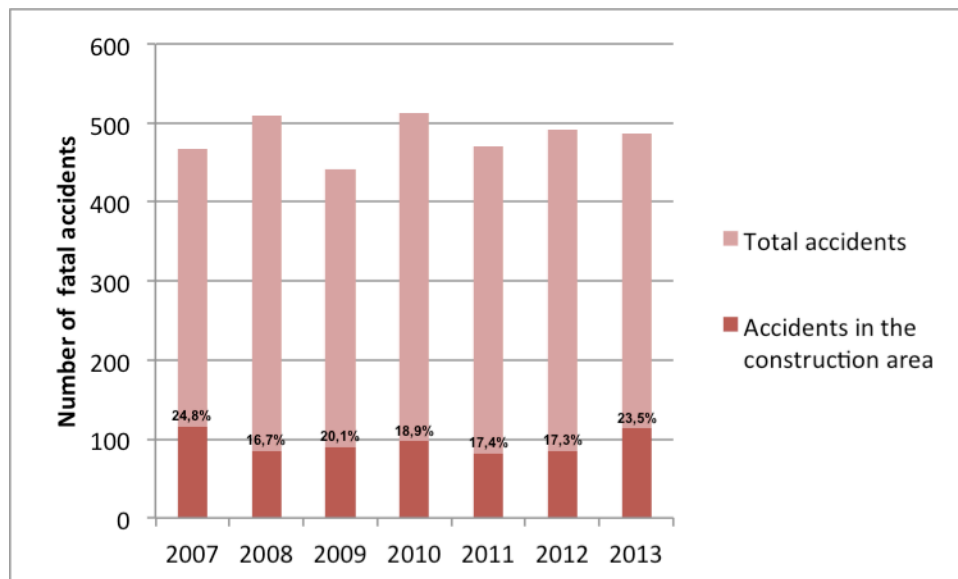


Figure 25 - Accidentes laborales fatales en Chile

Nos gustaría recibir su opinión acerca de los potenciales problemas y beneficios de introducir el modelo de Educación Dual exportado de Alemania a la realidad Chilena para mejorar la situación actual. Esto con el fin de crear simultáneamente un mejor futuro para los trabajadores chilenos y la beneficiar a la industria de la construcción.

La siguiente encuesta tiene como fin recopilar información para analizar la actual situación en Chile respecto a la capacitación de los trabajadores en el mundo laboral.

La encuesta consta de 15 preguntas y tiene una duración aproximada de 6 minutos. Sus respuestas serán tratadas de forma confidencial y anónima. Es importante que responda con sinceridad.

¡De antemano muchas gracias por sus respuestas!

Sobre el encuestado

1. ¿Qué rol desempeña usted en el liceo donde trabaja?
(Respuesta abierta)
2. ¿Qué nivel de estudios posee?
 - a. Educación Media
 - b. Técnico del Nivel Superior
 - c. Bachiller
 - d. Licenciado
 - e. Título Profesional
 - f. Magíster
 - g. Doctorado
3. ¿Conoce el sistema de Educación Dual?
 - a. Sí
 - b. No

Sobre la situación actual en Chile

4. ¿Cree usted que el nivel educacional o de capacitación de los trabajadores de la construcción, con respecto a los conocimientos básicos requeridos para TRABAJAR EFICIENTEMENTE en una obra de construcción, es insuficiente?
 - a. Sí
 - b. No
5. ¿Cree usted que el nivel educacional o de capacitación de los trabajadores de la construcción, con respecto a los conocimientos básicos requeridos para TRABAJAR DE FORMA SEGURA Y EVITAR ACCIDENTES en una obra de construcción, es insuficiente?
 - a. Sí
 - b. No
6. A continuación se mencionan 5 factores personales que la dirección del trabajo define como causas básicas de accidentes laborales. Por favor, ORDENE los factores anteriores de acuerdo a que tan frecuentemente generan accidentes. Donde 1 implica más frecuentemente y 5 no tan frecuentemente.
 - a. Falta de conocimiento o capacidad para desarrollar el trabajo encomendado
 - b. Falta de motivación o motivación inadecuada
 - c. Tratar de ahorrar tiempo o esfuerzo y/o incomodidades
 - d. Lograr la atención de los demás
 - e. Existencia de problemas o discapacidades físicas o mentales

7. Con respecto a los trabajadores de la construcción que se desempeñan en la obra gruesa ¿En qué áreas dichos trabajadores presentan falencias que entorpecen o dificultan trabajar de una manera efectiva? (puede elegir más de una opción)
 - a. Conocimientos sobre el uso de herramientas (uso, almacenamiento, transporte, medidas de seguridad, etc.)
 - b. Conocimientos sobre materiales (preparación, almacenamiento, transporte, etc.)
 - c. Conocimientos sobre ciencias básicas
 - d. Conocimientos sobre calidad en el trabajo realizado
 - e. Conocimientos básicos de seguridad
 - f. Conocimientos básicos de protección ambiental
 - g. Actitud laboral
 - h. Trabajo en equipo
8. ¿Cree usted que la CALIDAD DE LAS OBRAS DE CONSTRUCCIÓN sería mayor si se contara con personal más preparado, es decir, si todos los trabajadores estuvieran educados a través de carreras técnicas o cursos de capacitación para desempeñar sus tareas diarias?
 - a. Sí
 - b. No
9. ¿Cree usted que mejoraría la SEGURIDAD EN LAS OBRAS DE CONSTRUCCIÓN si se contara con personal más preparado, es decir, si todos los trabajadores estuvieran educados a través de carreras técnicas o cursos de capacitación para desempeñar sus tareas diarias?
 - a. Sí
 - b. No

Sobre el sistema de Educación Dual

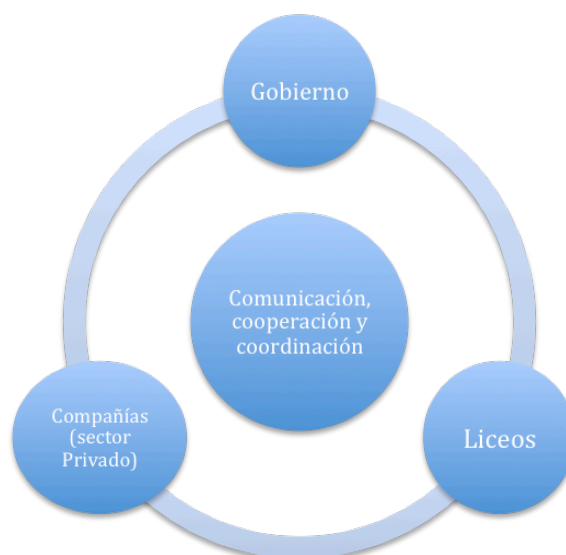
El sistema de Educación Dual es un sistema importado desde Alemania. En él las empresas participan activamente junto con los institutos técnicos en la formación de profesionales. Este sistema ayuda a las empresas a obtener profesionales altamente calificados que satisfagan sus necesidades.

El este sistema de Educación Dual, los estudiantes pasan una parte del tiempo en el instituto educacional donde aprenden teoría y la otra parte del tiempo en una compañía adquieren experiencia laboral.

En este sistema, las compañías financian la parte del entrenamiento que el estudiante realice en la misma. Las razones por las cuales compañías alemanas deciden formar parte de este tipo de educación son las siguientes:

1. Los profesionales formados en la empresa se ajustan mejor a las necesidades de la empresa (94%)
2. Especialista en dicha área no estaba disponible en el mercado (93%)
3. Posibilidad de elegir el mejor candidato al momento de emplear a alguien después del periodo de entrenamiento (72%)
4. Baja rotación de personal debido a empleados leales a la compañía (71%)

5. Mejorar la competitividad de la compañía en el futuro (64%)
 6. Evitar el riesgo de contratar equívocamente una persona externa no apta para el cargo (58%)
 7. Ahorro de tiempo y dinero gastado en adaptar y familiarizar a un trabajador externo (56%)
10. Basado en esta información ¿Estima que la Educación Dual es atractiva para el sector privado?
- a. Sí
 - b. No
- 11.



- Para poder organizar y regular efectivamente el sistema de Educación Dual, el gobierno, los liceos y las empresas deben trabajar en conjunto. El gobierno junto con los liceos y empresas conforman una entidad que: (1) diseña los planes de estudio, (2) regula y fiscaliza el correcto funcionamiento del sistema, (3) regula quién puede ser parte del sistema, (4) ayuda a los estudiantes a encontrar un puesto de trabajo en las compañías participantes y (5) supervisa las evaluaciones finales de los estudiantes para graduarse. ¿Estaría usted interesado en trabajar en conjunto con empresas y el gobierno para ser parte de la Educación Dual?
- a. Sí
 - b. No
12. ¿Cree usted que las empresas estarían dispuestas a pagar sueldos un poco mayores si contara con personal más calificado que le asegurara mayores estándares de calidad?
- a. Sí
 - b. No

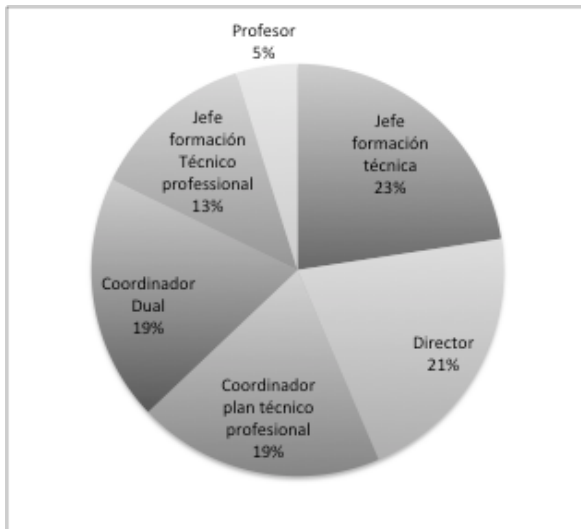
13. ¿Qué CONOCIMIENTOS estima usted deberían aprender los estudiantes de carreras técnicas que se desempeñarán como trabajadores en la obra gruesa de la construcción?
- a. Matemáticas
 - b. Física Básica
 - c. Química básica para materiales de la construcción
 - d. Normas de seguridad
 - e. Lectura de planos técnicos
 - f. Otro
14. ¿Qué HABILIDADES estima usted deberían aprender los estudiantes de carreras técnicas que se desempeñarán como trabajadores en la obra gruesa de la construcción?
- a. Mantenimiento de Herramientas
 - b. Fabricación y colocación de encofrados
 - c. Colocación y compactación de Hormigón
 - d. Fabricación y colocación de enfierradura para hormigón armado
 - e. Instalación de andamios
 - f. Excavación de zanjas
 - g. Trabajo en equipo
 - h. Procedimientos de seguridad
 - i. Otro

Annex F – Answers survey 1 (Technical Schools)

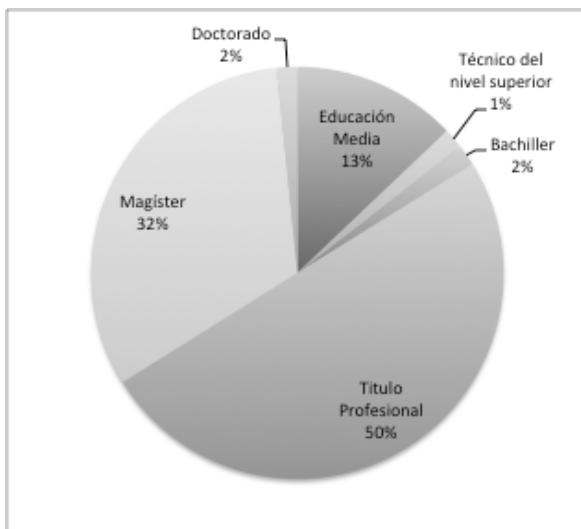
Número total de respuestas válidas: 63

Sobre el encuestado

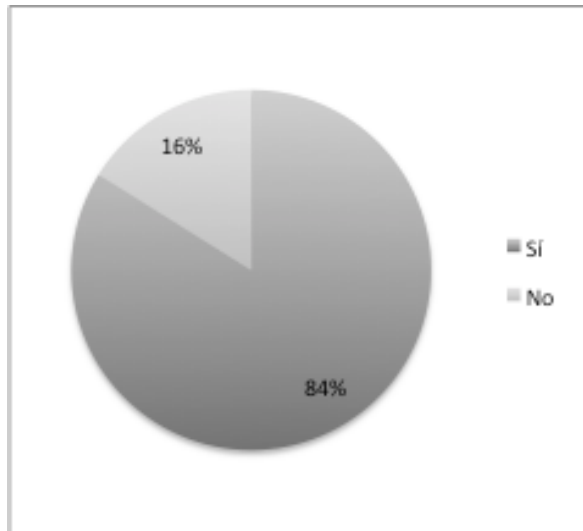
1. ¿Qué rol desempeña usted en el liceo donde trabaja?



2. ¿Qué nivel de estudios posee?

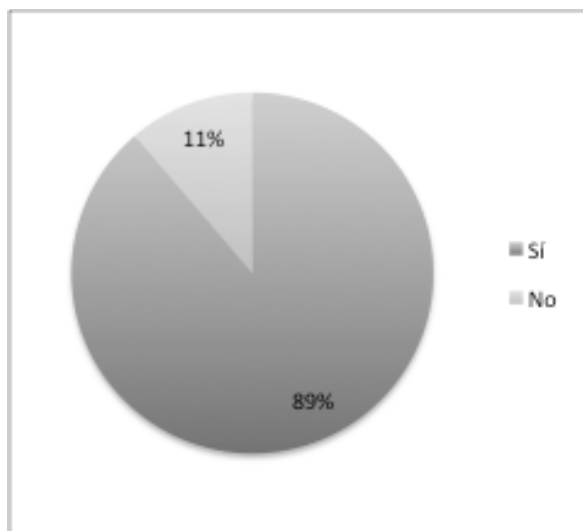


3. ¿Conoce el sistema de Educación Dual?

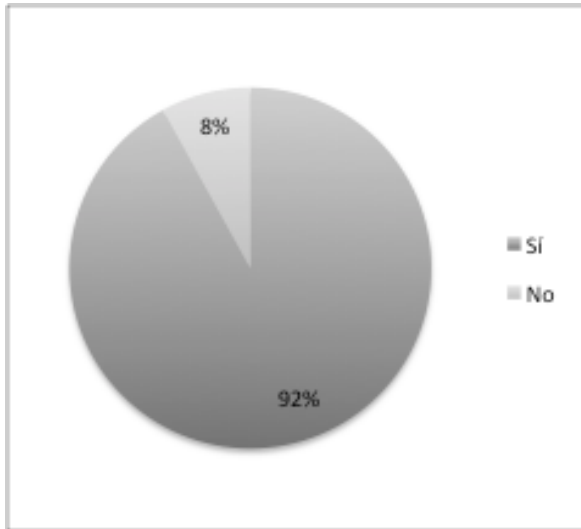


Sobre la situación actual en Chile

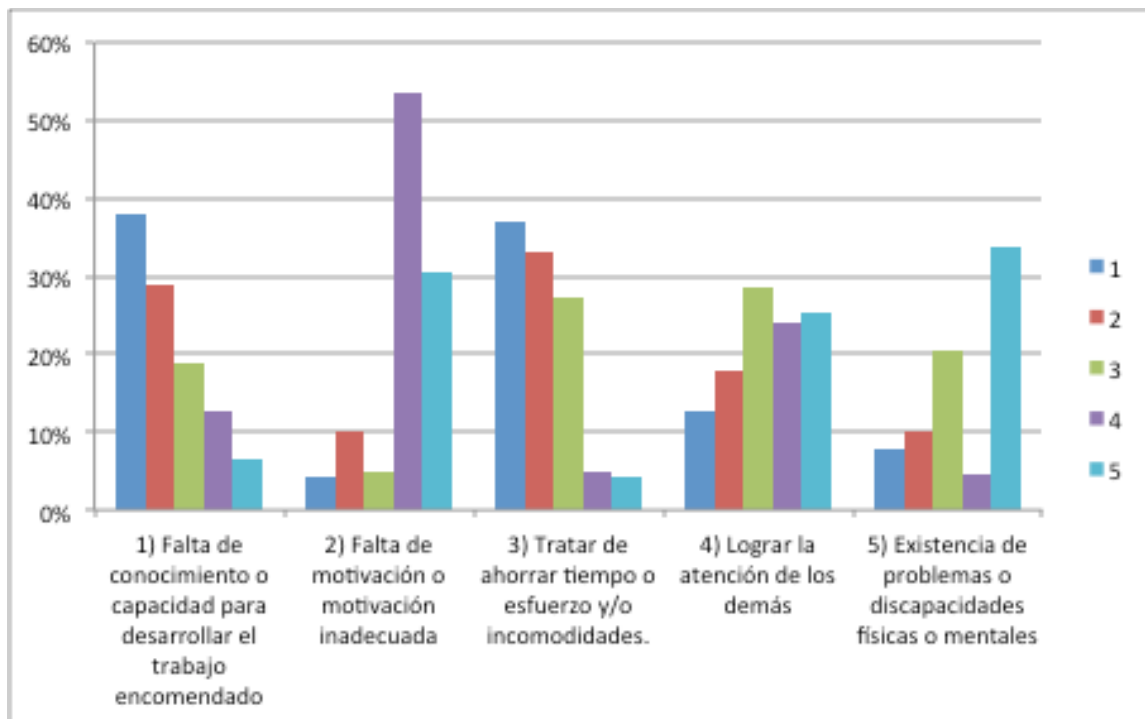
4. ¿Cree usted que el nivel educacional o de capacitación de los trabajadores de la construcción, con respecto a los conocimientos básicos requeridos para TRABAJAR EFICIENTEMENTE en una obra de construcción, es insuficiente?



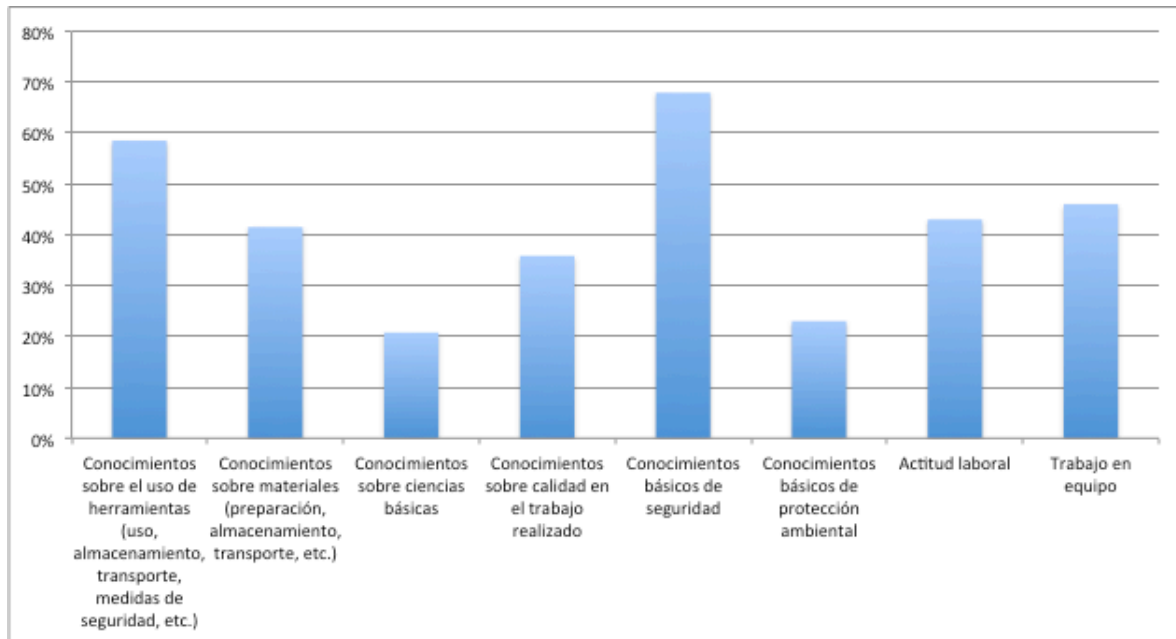
5. ¿Cree usted que el nivel educacional o de capacitación de los trabajadores de la construcción, con respecto a los conocimientos básicos requeridos para TRABAJAR DE FORMA SEGURA Y EVITAR ACCIDENTES en una obra de construcción, es insuficiente?



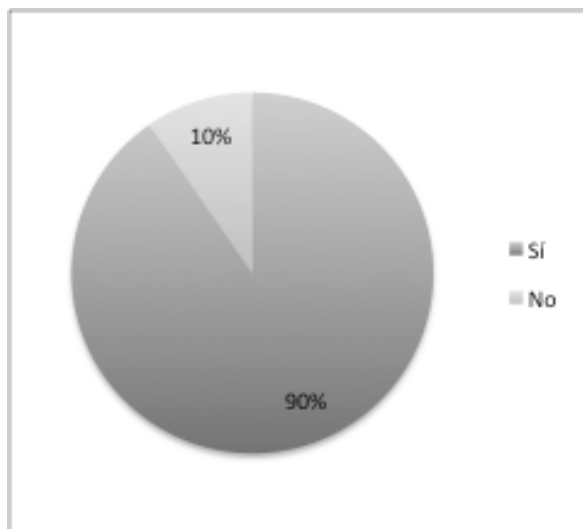
6. A continuación se mencionan 5 factores personales que la dirección del trabajo define como causas básicas de accidentes laborales. Por favor, ORDENE los factores anteriores de acuerdo a que tan frecuentemente generan accidentes. Donde 1 implica más frecuentemente y 5 no tan frecuentemente.



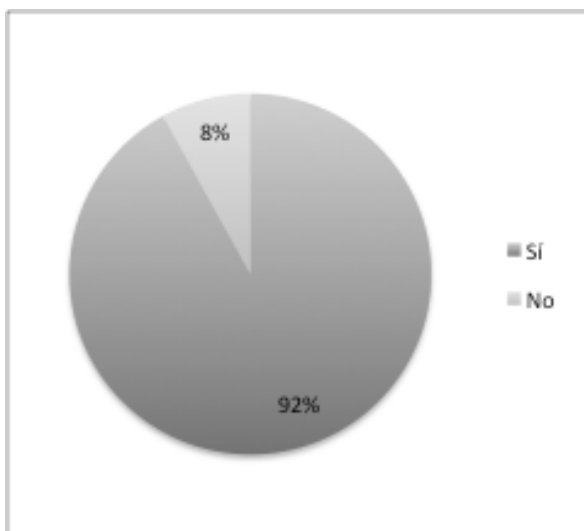
7. Con respecto a los trabajadores de la construcción que se desempeñan en la obra gruesa ¿En qué áreas dichos trabajadores presentan falencias que entorpecen o dificultan trabajar de una manera efectiva? (puede elegir más de una opción)



8. ¿Cree usted que la CALIDAD DE LAS OBRAS DE CONSTRUCCIÓN sería mayor si se contara con personal más preparado, es decir, si todos los trabajadores estuvieran educados a través de carreras técnicas o cursos de capacitación para desempeñar sus tareas diarias?

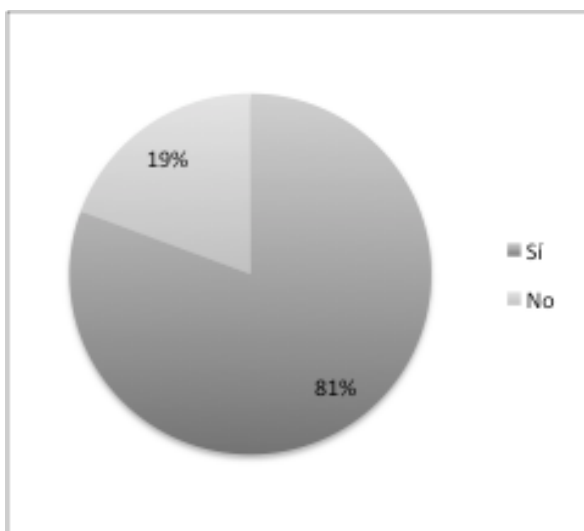


9. ¿Cree usted que mejoraría la SEGURIDAD EN LAS OBRAS DE CONSTRUCCIÓN si se contara con personal más preparado, es decir, si todos los trabajadores estuvieran educados a través de carreras técnicas o cursos de capacitación para desempeñar sus tareas diarias?



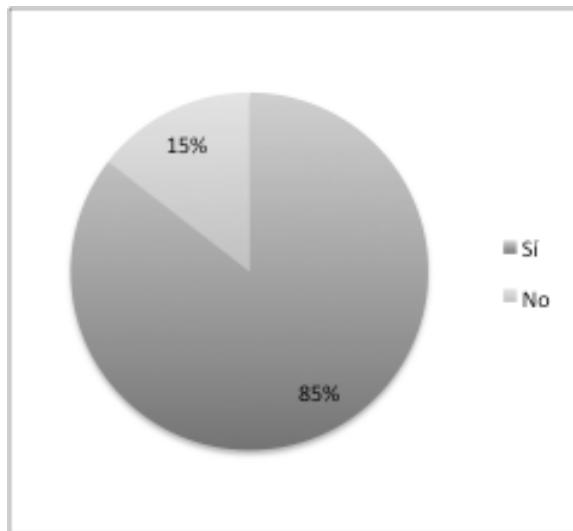
Sobre el sistema de Educación Dual

10. Basado en esta información⁷⁰ ¿Estima que la Educación Dual es atractiva para el sector privado?

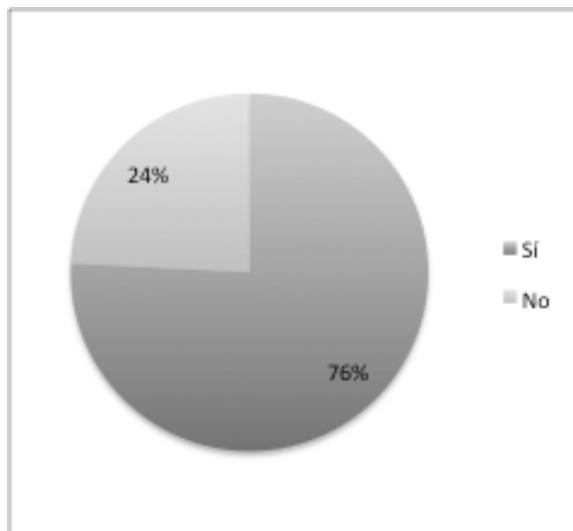


⁷⁰ Información proporcionada en el encabezado de la sección. Revisar apéndice ¿?

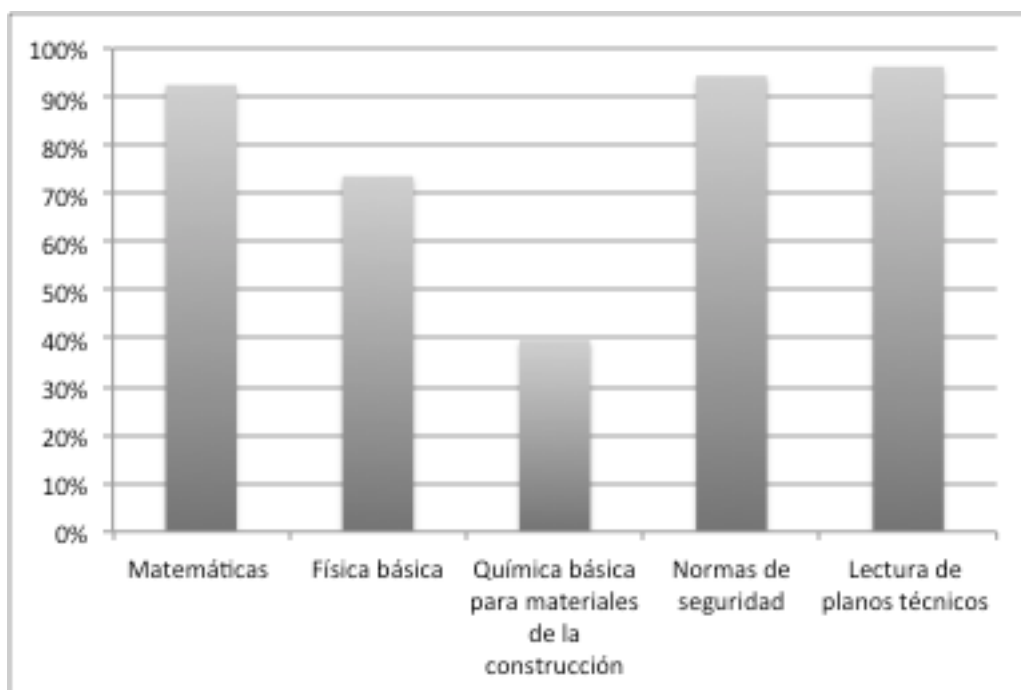
11. ¿Estaría usted interesado en trabajar en conjunto con empresas y el gobierno para ser parte de la Educación Dual?



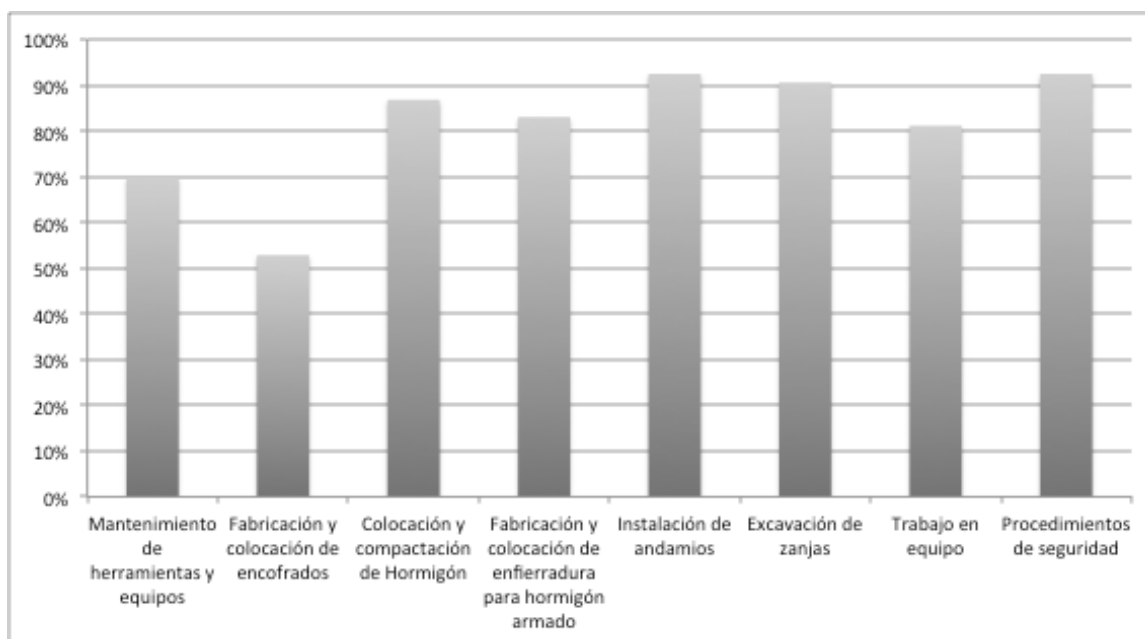
12. ¿Cree usted que las empresas estarían dispuestas a pagar sueldos un poco mayores si contara con personal más calificado que le asegurara mayores estándares de calidad?



13. ¿Qué CONOCIMIENTOS estima usted deberían aprender los estudiantes de carreras técnicas que se desempeñarán como trabajadores en la obra gruesa de la construcción?



14. ¿Qué HABILIDADES estima usted deberían aprender los estudiantes de carreras técnicas que se desempeñarán como trabajadores en la obra gruesa de la construcción?



Annex G – Survey 2 (for Companies)

Introducción

El 2013 en Chile el departamento de estadística registró 467 accidentes fatales de los cuales el 25% correspondieron al área de la construcción. En el gráfico adjunto se puede apreciar que el mismo escenario se repite cada año. Además, la cámara Chilena de la construcción afirma que el 64% de los obreros de la construcción no ha recibido ningún tipo de capacitación. ¿Cree usted que estos hechos estén correlacionados?

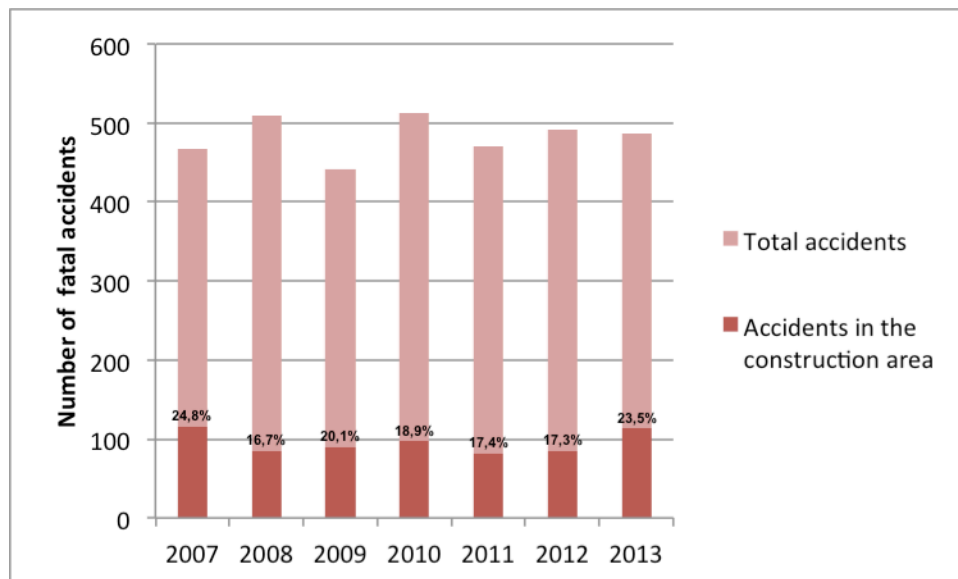


Figure 20 - Accidentes laborales fatales en Chile

Nos gustaría recibir su opinión acerca de los potenciales problemas y beneficios de introducir el modelo de Educación Dual exportado de Alemania a la realidad Chilena para mejorar la situación actual. Esto con el fin de crear simultáneamente un mejor futuro para los trabajadores chilenos y la beneficiar a la industria de la construcción.

La siguiente encuesta tiene como fin recopilar información para analizar la actual situación en Chile respecto a la capacitación de los trabajadores en el mundo laboral.

La encuesta consta de 15 preguntas y tiene una duración aproximada de 6 minutos. Sus respuestas serán tratadas de forma confidencial y anónima. Es importante que responda con sinceridad.

¡De antemano muchas gracias por sus respuestas!

Sobre el encuestado

1. ¿Qué rol desempeña usted en la compañía donde trabaja?
(Respuesta abierta)
2. ¿Qué nivel de estudios posee?
 - a. Educación Media
 - b. Técnico del Nivel Superior
 - c. Bachiller
 - d. Licenciado
 - e. Título Profesional
 - f. Magíster
 - g. Doctorado
3. ¿Conoce el sistema de Educación Dual?
 - a. Sí
 - b. No

Sobre la situación actual en Chile

4. ¿Cree usted que el nivel educacional o de capacitación de los trabajadores de la construcción, con respecto a los conocimientos básicos requeridos para TRABAJAR EFICIENTEMENTE en una obra de construcción, es insuficiente?
 - a. Sí
 - b. No
5. ¿Cree usted que el nivel educacional o de capacitación de los trabajadores de la construcción, con respecto a los conocimientos básicos requeridos para TRABAJAR DE FORMA SEGURA Y EVITAR ACCIDENTES en una obra de construcción, es insuficiente?
 - a. Sí
 - b. No
6. A continuación se mencionan 5 factores personales que la dirección del trabajo define como causas básicas de accidentes laborales. Por favor, ORDENE los factores anteriores de acuerdo a que tan frecuentemente generan accidentes. Donde 1 implica más frecuentemente y 5 no tan frecuentemente.
 - a. Falta de conocimiento o capacidad para desarrollar el trabajo encomendado
 - b. Falta de motivación o motivación inadecuada
 - c. Tratar de ahorrar tiempo o esfuerzo y/o incomodidades
 - d. Lograr la atención de los demás
 - e. Existencia de problemas o discapacidades físicas o mentales

7. Con respecto a los trabajadores de la construcción que se desempeñan en la obra gruesa ¿En qué áreas dichos trabajadores presentan falencias que entorpecen o dificultan trabajar de una manera efectiva? (puede elegir más de una opción)
 - a. Conocimientos sobre el uso de herramientas (uso, almacenamiento, transporte, medidas de seguridad, etc.)
 - b. Conocimientos sobre materiales (preparación, almacenamiento, transporte, etc.)
 - c. Conocimientos sobre ciencias básicas
 - d. Conocimientos sobre calidad en el trabajo realizado
 - e. Conocimientos básicos de seguridad
 - f. Conocimientos básicos de protección ambiental
 - g. Actitud laboral
 - h. Trabajo en equipo
8. ¿Cree usted que la CALIDAD DE LAS OBRAS DE CONSTRUCCIÓN sería mayor si se contara con personal más preparado, es decir, si todos los trabajadores estuvieran educados a través de carreras técnicas o cursos de capacitación para desempeñar sus tareas diarias?
 - a. Sí
 - b. No
9. ¿Cree usted que mejoraría la SEGURIDAD EN LAS OBRAS DE CONSTRUCCIÓN si se contara con personal más preparado, es decir, si todos los trabajadores estuvieran educados a través de carreras técnicas o cursos de capacitación para desempeñar sus tareas diarias?
 - a. Sí
 - b. No

Sobre el sistema de Educación Dual

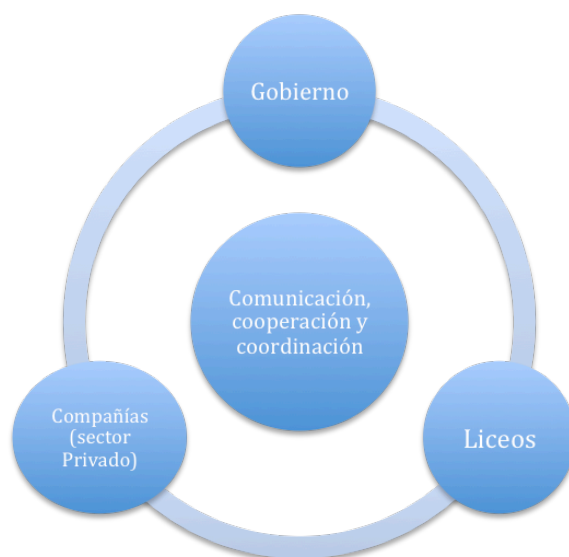
El sistema de Educación Dual es un sistema importado desde Alemania. En él las empresas participan activamente junto con los institutos técnicos en la formación de profesionales. Este sistema ayuda a las empresas a obtener profesionales altamente calificados que satisfagan sus necesidades.

El este sistema de Educación Dual, los estudiantes pasan una parte del tiempo en el instituto educacional donde aprenden teoría y la otra parte del tiempo en una compañía adquieren experiencia laboral.

En este sistema, las compañías financian la parte del entrenamiento que el estudiante realice en la misma. Las razones por las cuales compañías alemanas deciden formar parte de este tipo de educación son las siguientes:

8. Los profesionales formados en la empresa se ajustan mejor a las necesidades de la empresa (94%)
9. Especialista en dicha área no estaba disponible en el mercado (93%)
10. Posibilidad de elegir el mejor candidato al momento de emplear a alguien después del periodo de entrenamiento (72%)
11. Baja rotación de personal debido a empleados leales a la compañía (71%)

12. Mejorar la competitividad de la compañía en el futuro (64%)
 13. Evitar el riesgo de contratar equívocamente una persona externa no apta para el cargo (58%)
 14. Ahorro de tiempo y dinero gastado en adaptar y familiarizar a un trabajador externo (56%)
10. Basado en esta información ¿Estima que la Educación Dual es atractiva para el sector privado?
- a. Sí
 - b. No
- 11.



- Para poder organizar y regular efectivamente el sistema de Educación Dual, el gobierno, los liceos y las empresas deben trabajar en conjunto. El gobierno junto con los liceos y empresas conforman una entidad que: (1) diseña los planes de estudio, (2) regula y fiscaliza el correcto funcionamiento del sistema, (3) regula quién puede ser parte del sistema, (4) ayuda a los estudiantes a encontrar un puesto de trabajo en las compañías participantes y (5) supervisa las evaluaciones finales de los estudiantes para graduarse. ¿Estaría usted interesado en trabajar en conjunto con liceos y el gobierno para ser parte de la Educación Dual?
- a. Sí
 - b. No
12. ¿Estaría usted dispuesto a pagar sueldos un poco mayores si contara con personal más calificado que le asegurara mayores estándares de calidad?
- a. Sí
 - b. No

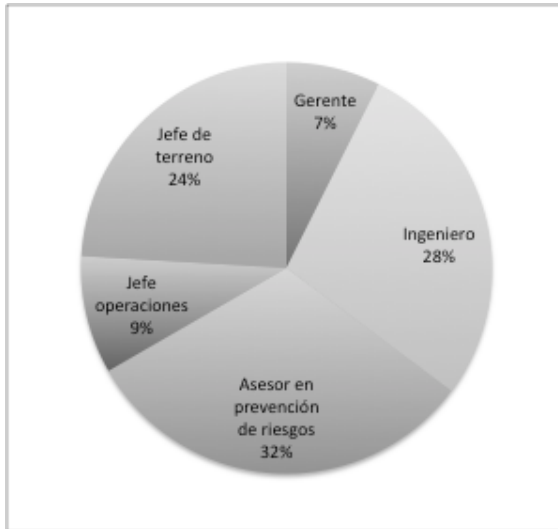
13. ¿Qué CONOCIMIENTOS estima usted deberían aprender los estudiantes de carreras técnicas que se desempeñarán como trabajadores en la obra gruesa de la construcción?
- a. Matemáticas
 - b. Física Básica
 - c. Química básica para materiales de la construcción
 - d. Normas de seguridad
 - e. Lectura de planos técnicos
 - f. Otro
14. ¿Qué HABILIDADES estima usted deberían aprender los estudiantes de carreras técnicas que se desempeñarán como trabajadores en la obra gruesa de la construcción?
- a. Mantenimiento de Herramientas
 - b. Fabricación y colocación de encofrados
 - c. Colocación y compactación de Hormigón
 - d. Fabricación y colocación de enfierradura para hormigón armado
 - e. Instalación de andamios
 - f. Excavación de zanjas
 - g. Trabajo en equipo
 - h. Procedimientos de seguridad
 - i. Otro

Annex H - Answers survey 2 (companies)

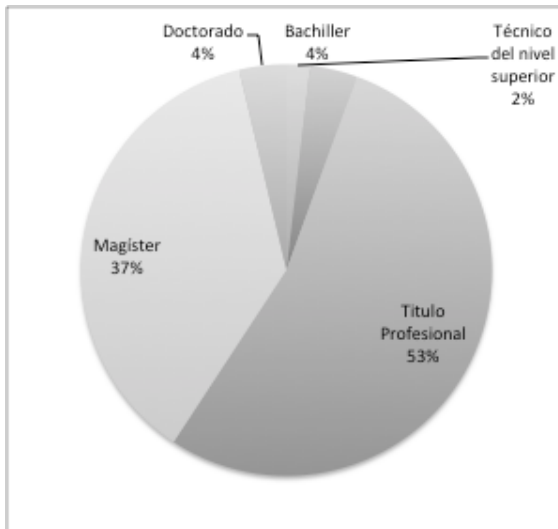
Número total de respuestas válidas: 54

Sobre el encuestado

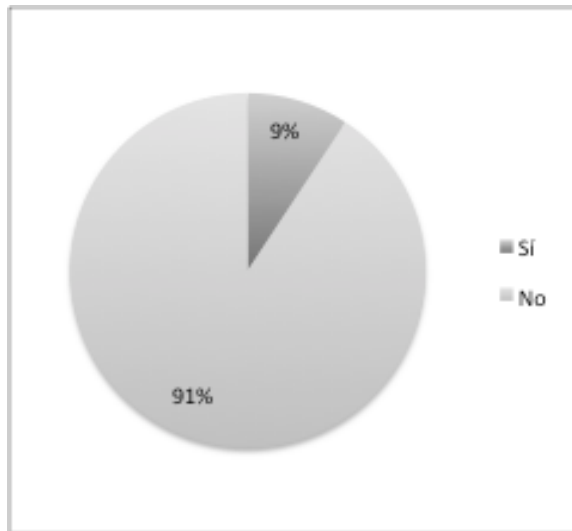
1. ¿Qué rol desempeña usted en la compañía donde trabaja?



2. ¿Qué nivel de estudios posee?

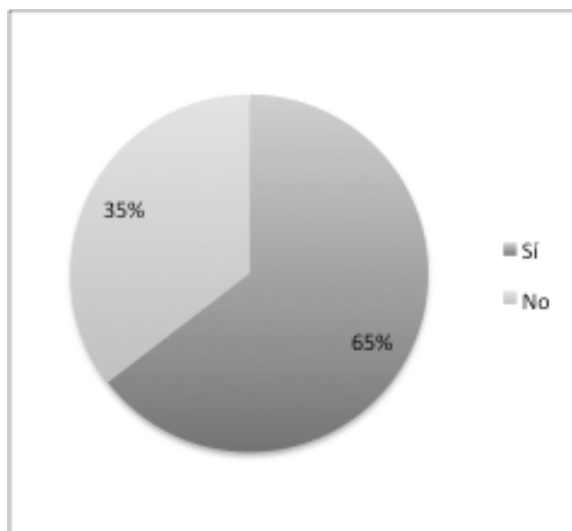


3. ¿Conoce el sistema de Educación Dual?

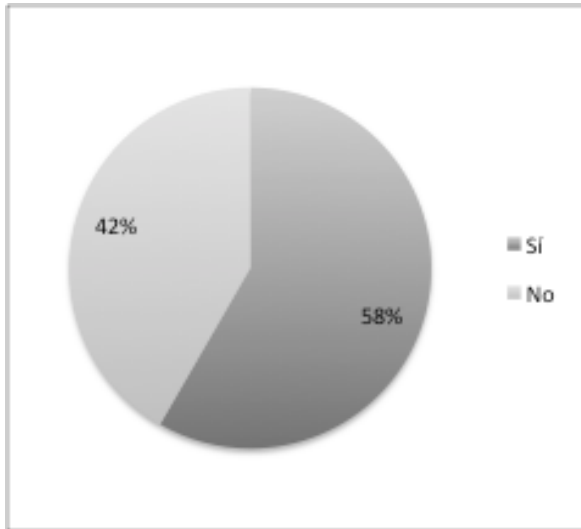


Sobre la situación actual en Chile

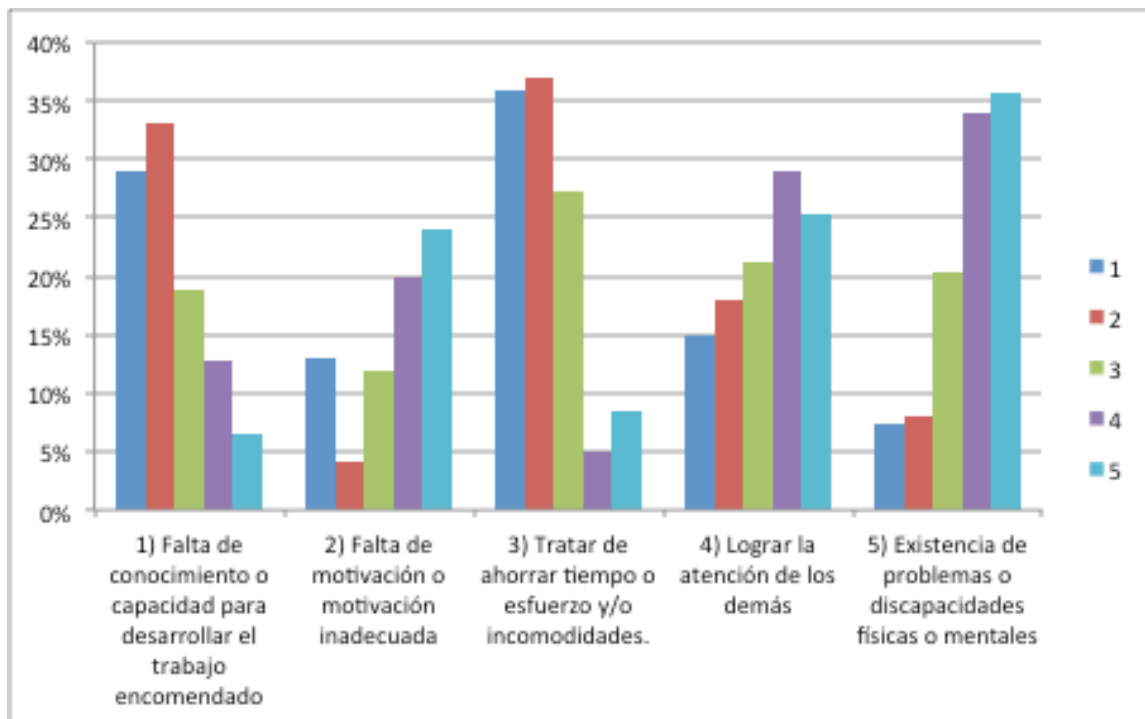
4. ¿Cree usted que el nivel educacional o de capacitación de los trabajadores de la construcción, con respecto a los conocimientos básicos requeridos para TRABAJAR EFICIENTEMENTE en una obra de construcción, es insuficiente?



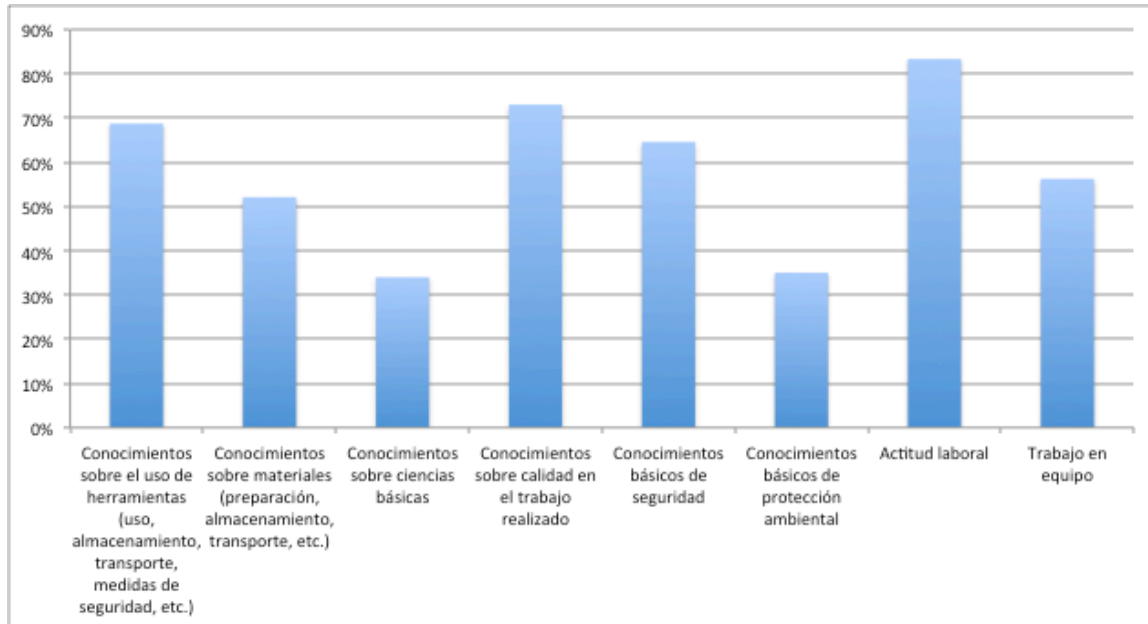
5. ¿Cree usted que el nivel educacional o de capacitación de los trabajadores de la construcción, con respecto a los conocimientos básicos requeridos para TRABAJAR DE FORMA SEGURA Y EVITAR ACCIDENTES en una obra de construcción, es insuficiente?



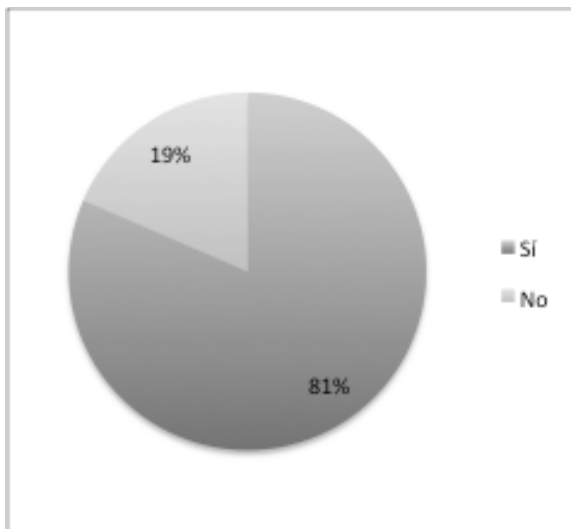
6. A continuación se mencionan 5 factores personales que la dirección del trabajo define como causas básicas de accidentes laborales. Por favor, ORDENE los factores anteriores de acuerdo a que tan frecuentemente generan accidentes. Donde 1 implica más frecuentemente y 5 no tan frecuentemente.



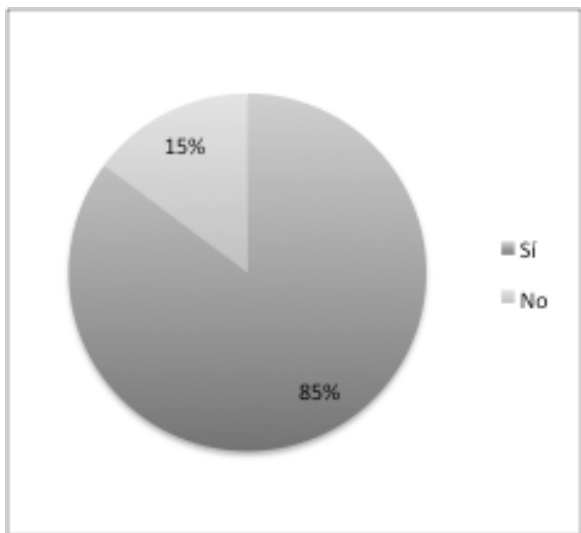
7. Con respecto a los trabajadores de la construcción que se desempeñan en la obra gruesa ¿En qué áreas dichos trabajadores presentan falencias que entorpecen o dificultan trabajar de una manera efectiva? (puede elegir más de una opción)



8. ¿Cree usted que la CALIDAD DE LAS OBRAS DE CONSTRUCCIÓN sería mayor si se contara con personal más preparado, es decir, si todos los trabajadores estuvieran educados a través de carreras técnicas o cursos de capacitación para desempeñar sus tareas diarias?

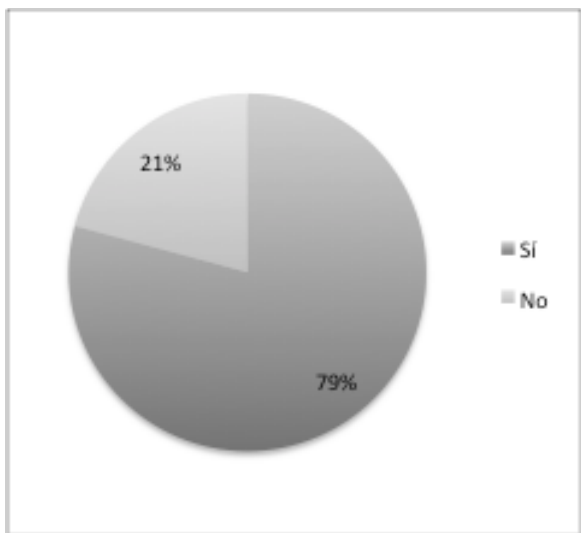


9. ¿Cree usted que mejoraría la SEGURIDAD EN LAS OBRAS DE CONSTRUCCIÓN si se contara con personal más preparado, es decir, si todos los trabajadores estuvieran educados a través de carreras técnicas o cursos de capacitación para desempeñar sus tareas diarias?



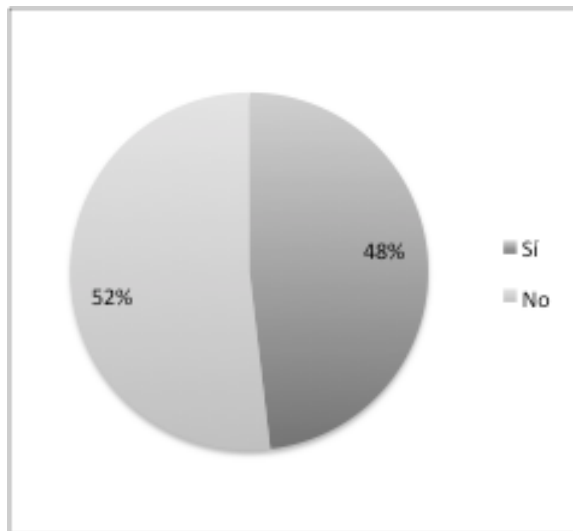
Sobre el sistema de Educación Dual

10. Basado en esta información⁷¹ ¿Estaría usted interesado en ser parte de la Educación Dual?

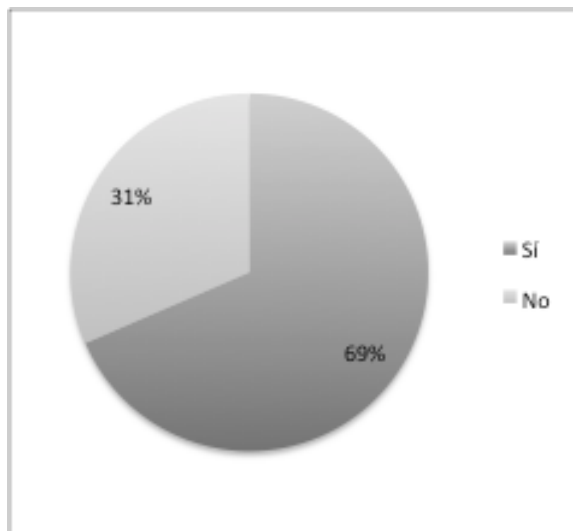


⁷¹ Información proporcionada en el encabezado de la sección. Revisar apéndice ¿?

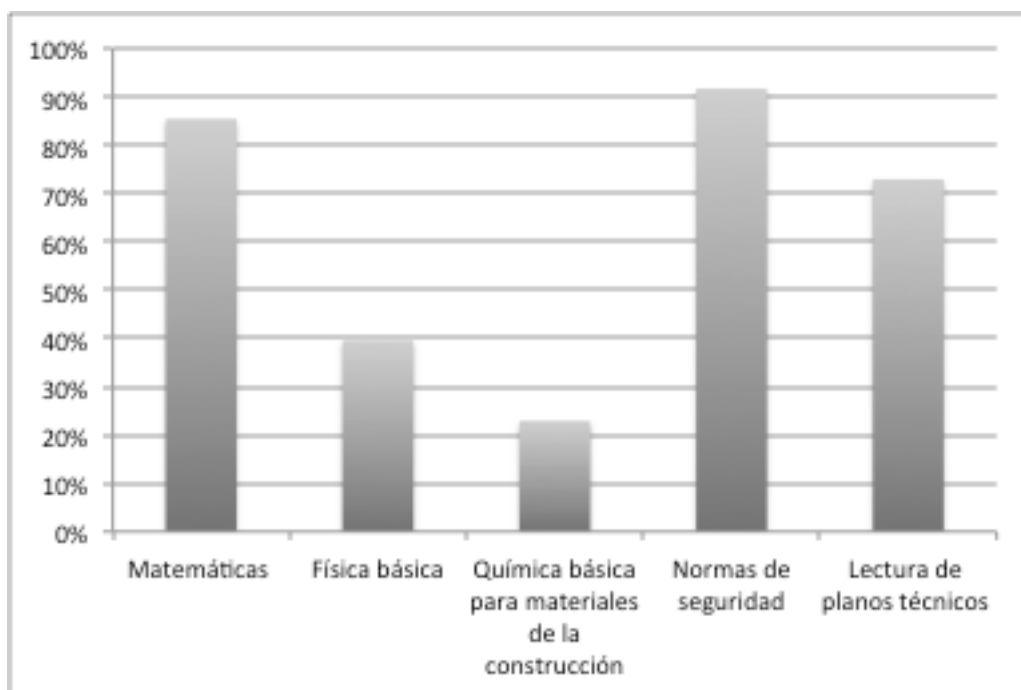
11. ¿Estaría usted interesado en trabajar en conjunto con los liceos y el gobierno para ser parte de la Educación Dual?



12. ¿Estaría usted dispuesto a pagar sueldos un poco mayores si contara con personal más calificado que le asegurara mayores estándares de calidad?



13. ¿Qué CONOCIMIENTOS estima usted deberían aprender los estudiantes de carreras técnicas que se desempeñarán como trabajadores en la obra gruesa de la construcción?



14. ¿Qué HABILIDADES estima usted deberían aprender los estudiantes de carreras técnicas que se desempeñarán como trabajadores en la obra gruesa de la construcción?

