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INDEX

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Ada Augusta Celestino Bezerra
Amin Aur
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Rodrigo Filgueira
Rodrigo Manoel Dias da Silva
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EDITORIAL

Esta edição especial trilíngue sobre Aprendizagem Baseada em Projetos (ABP) é um dos resultados da parceria firmada entre o Senac e o Centro Interamericano para o Desenvolvimento do Conhecimento na Formação Profissional (Cinterfor), um serviço técnico da Organização Internacional do Trabalho (OIT). Uma colaboração que evolve instituições do setor em nível mundial para o compartilhamento das tendências mais atuais em formação para o trabalho, com ações e projetos que promovem a qualidade da Educação Profissional de forma interconectada em todo o globo.

Do Senac Nacional, Anderson Pena e Daniela Papelbaum mostram os resultados da nova pedagogia institucional em *Projetos integradores como unidade curricular obrigatória em cursos de educação profissional: a aderência das práticas educativas ao Modelo Pedagógico Senac*.

A partir de dados recentes do Cinterfor/OIT, o panorama do futuro da formação para o trabalho está no artigo de Rodrigo Filgueira: *Reduzindo a futura lacuna de competências na América Latina e no Caribe por meio de inovações em educação aplicada*.

Mostrando como se escreve a história da educação profissional no Chile, o SNA Educa apresenta o artigo *Modelo pedagógico de aprendizagem baseada em projetos para uma formação técnica contextualizada*, de Marta Liliana Estruch Abadie, Ema Luz Anatibia Leiva e Sofía Carolina Vergara Sanfuentes.

Da Colômbia, *A formação por projetos e a avaliação da aprendizagem*, de Liliam Zapata Pérez, foca as etapas de avaliação do aprendiz no Serviço Nacional de Aprendizagem (Sena). Também do Sena é o artigo de Carlos David Martínez Ramírez e Carlos Alberto Barón Serrano: *Passado, presente e futuro da formação por projetos na Colômbia*.

O ensino profissionalizante europeu também aparece nesta edição. *A aprendizagem baseada nos desafios da educação profissional do País Basco*, de Eugenio Astigarraga e Agustin Agirre, descreve como o Centro para a Investigação e a Inovação da Educação Profissional Tknika prepara os alunos para o mercado contemporâneo, dinamizado pela tecnologia.

De Moscou, na Rússia, *Treinamento profissional: novas competências em instituições de ensino pelo uso da tecnologia* traz um dos mais inovadores centros de educação profissional da atualidade – Skolkovo, no artigo de Valeria Dovgalskaya, Denis Konanchuk e Daniil Dobrynchenko.

Já os pesquisadores da Universidade de Bremen Michael Gessler e Andreas Sebe-Opfermann apresentam o sucesso do modelo alemão que se expande para outros países europeus no artigo *Aprendizagem baseada em projetos em escolas de educação profissional da Alemanha: uma abordagem estruturada para o desenvolvimento de competências autodeterminadas e de resolução de problemas de maneira cooperativa*.

A entrevista de Fernando Vargas, Especialista Sênior em Educação Profissional do Cinterfor/OIT, com Ana Beatriz Waehneldt, Diretora de Educação Profissional do Departamento Nacional do Senac, contextualiza um pouco mais esta parceria para o desenvolvimento de pesquisas sobre ABP.

Para terminar, a resenha de Jarbas Novelino Barato esclarece três obras emblemáticas para se compreender o tema: *Aprendizagem baseada em projetos* (Bender), *The project method* (Kilpatrick) e *Introdução ao estudo da escola nova*, de Lourenço Filho.

Ótima leitura!

INTEGRATING PROJECTS AS A MANDATORY CURRICULAR UNIT IN VOCATIONAL EDUCATION COURSES: ADHERENCE OF THE EDUCATIONAL PRACTICES TO THE SENAC PEDAGOGICAL MODEL[1]

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Abstract

The article presents the results of a quantitative-qualitative research with 2.221 teachers who act on the implementation of the new Senac Pedagogical Model throughout Brazil. With a national average of 8.33 points of adherence of the pedagogical practices by the Integrating Project Curricular Units of the courses, the study concluded that the Integrating Projects have been implemented successfully in the Regional Departments. The continued training actions should be expanded, and national strategies should be developed to encourage innovation through projects.

Keywords: Integrating Project. Active methodologies. Vocational education.

1. Introduction

In 2013, the National Department of Senac, together with the Regional Departments, started an important nationwide action to offer vocational education for Learning Courses, Professional Qualification and High-School Level Technical Qualification, called Senac Pedagogical Model (SPM) (SENAC, 2015c). The SPM presents a set of guiding concepts regarding the educational practices carried out at Senac, aligned with the institutional mission of educating for work in trade, services and tourism activities.

Some of the central aspects of the Model are the organization of courses into curricular structures defined as Curricular Units (CU), expressed in National Course Plans; the Senac Formative Marks[2]; the references for assessment and, particularly, the insertion of Integrating Projects (IP) as compulsory CUs of the courses. The IP refers to an educational practice based on active learning methodologies, whose principle is the articulation of competences, through social interactions and sharing of experiences, in the search for solutions to challenges generated in the context of occupation, the object of the vocational training.

In 2017, there were more than 250 thousand enrollments in courses aligned to the Pedagogical Model, filling approximately 70% of the spots offered[3]. Although this percentage indicates that the expansion of the Pedagogical Model is growing throughout the country, there is a need to understand how the educational practices are carried out, within the framework of the principles and guidelines of the Model, and how much they adhere to its premises.

The objective of this research, therefore, was to understand, from the perspective of the teachers, how the Curricular Unit Integrating Project (CUIP), strategic for the articulation of competences that integrate the professional profile and the development of the Senac Formative Marks, has been carried out throughout Senac. Above all, it sought to quantify, using a synthetic indicator, to what level teachers' perception and teaching practices adhere to the developmental assumptions of the Integrating Projects in the courses aligned to the SPM.

There is a need to understand how the educational practices are carried out

Guided by this goal, this article presents the results of the research in six parts. The first one presents the Integrating Project Differentiated Nature Curricular Unit as an integral aspect of the curricular organization of the SPM courses. The next section describes the methodological course of the research. The following items discuss the results, and, lastly, the final discussions and recommendations are presented.

2. The Integrating Project Differentiated Nature Curricular Unit

The SPM, with the aim of providing meaningful learning experiences based on "learning by doing" and on the dialogue between the classroom and the working world, sought references in Active Learning Methodologies, especially in Project-Based Learning (PBL), for the articulation of the competencies of the professional profiles of the courses, and to develop the Senac Formative Marks.

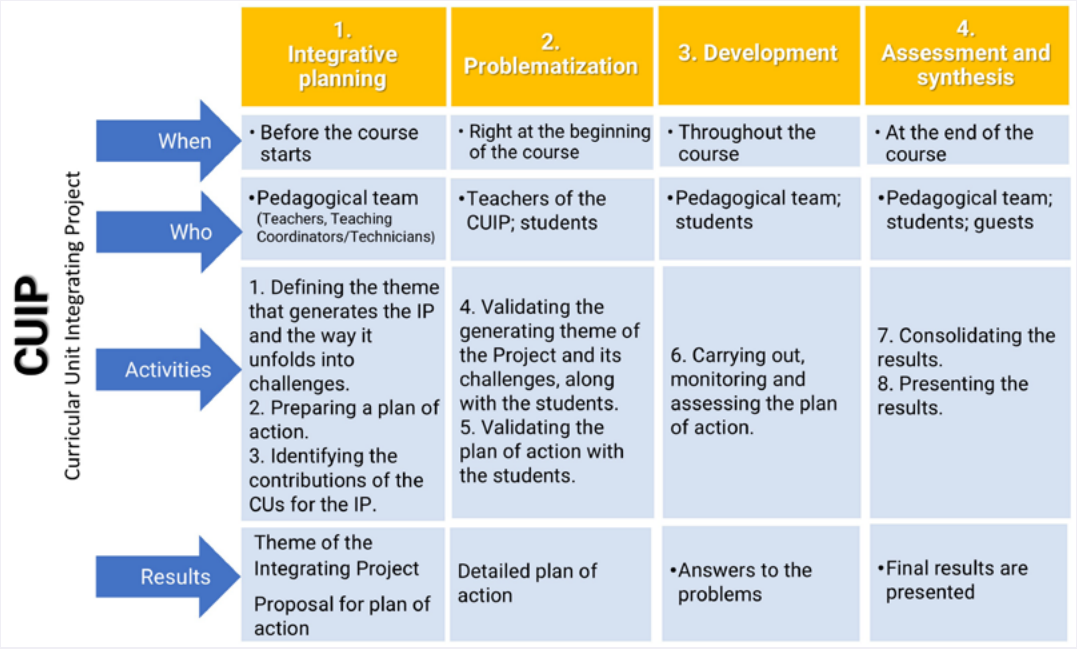
The PBL, whose origin dates back to the New School movement, which emerged between the end of the nineteenth century and the beginning of the next one, in the context of industrialization in Europe and North America, is an active and participatory pedagogical approach, focused on challenges involving the development of all stages of a project – planning, execution, monitoring, evaluation and delivery. Therefore, the experiment begins with the formulation of a challenging problem, which has no easy answer and stimulates imagination and creativity. Different types of knowledge, skills, attitudes and values, as well as teamwork, leadership and critical thinking are articulated and mobilized in the search for answers.

The literature on the subject identifies several researchers whose works contributed to the advancement of pedagogical proposals based on educational projects. Among them are the French scholars Ovide Decroly and Celestin Freinet, as well as Maria Montessori in Italy, and, especially, John Dewey, an important New School name in the United States, and William Kilpatrick, his disciple (SENAC, 2015e). The last two were particularly innovative, assigning to educational projects the characteristic of

pedagogical instruments organized to provide a meaningful experience, based on the assumptions of collective participation, and stimulus to autonomy and decision-making of the students (KILPATRICK, 1967).

In this sense, given the potential of PBL to articulate competencies from situations involving research, hypothesis testing, decision-making and teamwork to achieve the proposed objectives, this approach was brought to the curricular organization of the courses of the SPM. Thus, the CUIP became mandatory for the courses of Trade Quality Apprenticeship, Professional Qualification, High-School Level Professional Technical Qualification and their respective intermediate certifications. The following steps, presented in Figure 1, are foreseen for the development of the CUIP, according to the *Integrating Project Technical Document*[4] (SENAC, 2015c):

Figure 1 - Developmental steps for the CUIPs, according to the Technical Document



Source: Vocational Education Office, Senac, National Department.

Regarding the organizational aspect, the CUIP has a specific timetable (up to 10% of the total course time), a teacher in charge and its own Work Plan for Teachers (WPT), in which the activities to be carried out are detailed, as well as indicators and mentions for student evaluation, both from the perspective of the SPM[5]. Its execution occurs throughout the entire training process, which makes it a co-requisite for the other Curricular Units of the Professional Profile, and imposes a necessity of articulation among teachers, resulting in the integrated planning of a course in which learning situations[6] are presented in each CU, contributing to the completion of the IP. The National Course Plans present suggestions for generating

themes for the IPs, which does not rule out regional adaptations or new formulations that meet the motivations of students and teachers. These characteristics make the accomplishment of the IPs more complex, and its effectiveness will be linked directly to the effective collective and articulated participation between pedagogical team and students.

Aware of this issue, and in accordance with institutional policies for the continuing training of teachers, Senac National Department, together with the Regional Departments, has been investing in teacher training for the subjects of the Model, since the implementation of the Pedagogical Model, with special orientation towards the realization of IPs. The dissemination of the *Collection of Technical Documents of the Senac Pedagogical Model*[7], the implementation of courses, workshops and the on-site orientation of supervisors and pedagogical guides for the development of IPs are strategies implemented in this direction. If, on the one hand, actions of this nature are part of Senac's day-to-day life, on the other hand, there was until now a hiatus of information about how teachers were perceiving and implementing IPs throughout the national territory. The methodological course and the results of the research, topics presented below, seek to contribute to this discussion.

3. Methodology

The study used quantitative research as the main method for collecting and analyzing data, from online questionnaires applied to CUIP teachers (ALVES-MAZZOTTI; GEWANDSZNAJDER, 2004). This methodological option is justified by the need to construct indicative measures for the completion of the IPs in the Regional Departments, in order to obtain qualified information for the management strategies of the implementation of the Pedagogical Model. This characterizes the design of this work as applied research[8].

From the respondents' previous bases, forwarded by the Regional Departments, a sample survey plan was designed to obtain results with a sampling error[9] of 2.5% at the national level and up to 5.0% per Corporate Development Nucleus (North and Midwest, South-Southeast, and Northeast).

Three steps were necessary for the elaboration of the online questionnaires: I) studying the bibliography and elaborating of the item matrix; II) applying the pre-test to teachers of three Regional Departments, analyzing the results and adjusting the instruments; and III) developing the online versions of the questionnaires using the Sphinx software[10].

The items of the questionnaire were written based on the institutional guidelines for the realization of IPs, expressed in the *Integrating Project Technical Document* (SENAC, 2015e). For each item, therefore, there was an expected response consistent with its proper guideline, expressed in the Technical Document. Thus, zero value was attributed to responses that were not in agreement with the parameters and value 1

was given when the answer was in agreement. Since the statements were measured on a scale of agreement with 5 levels (totally disagree, partially disagree, do not agree or disagree, partially agree, totally agree), correct answers were considered to be those in which the teachers agreed partially or totally[11].

This measure intended to verify the degree of conformity between the pedagogical practices

Therefore, the more the pedagogical practice pointed out in the questionnaire by the teacher approached the expected response, the greater the probability that the CUIP provided by the teacher was developed in a manner aligned with the SPM assumptions. This structural logic was the basis for the construction of the CUIP adherence indicator. The calculation of this indicator (I_{adher}) considered the average of the individual indicators of adherence to the CUIPs reached by teachers, expressed in the formula:

$$I_{adher} = avr\ (II_{adher});\ II_{adher} = \frac{(\sum_{i=1}^{17} x_i)}{17}$$

Where: II_{ader} is the individual indicator of adherence to the methodology of the Integrating Project; x_i represents the score in statement.

This measure intended to verify the degree of conformity between the pedagogical practices carried out in the CUIPs and the methodological recommendations for the development of IPs in the Pedagogical Model, referenced in the Integrating Project Technical Document. After the application, validation methods and internal consistency of the information collected in the questionnaires were used to survey the descriptive statistics and analysis procedures (LAROS; PUENTE-PALACIOS, 2004; URBINA, 2007). However, part of the data obtained also underwent qualitative analysis, since the answers were categorized, interpreted and discussed according to their semantic nature (BARDIN, 2009; BOGDAN; BIKLEN, 1994; TUCKMAN, 2005). The analyses presented below were constructed from this methodological path.

4. Profile of the CUIP teachers

The questionnaires were e-mailed to 2,779 CUIP teachers from the Regional Departments from July 19 to August 20, 2017. In total, the National Department received 2,221 responses, reaching a percentage of 83%. According to respondents, Senac's CUIP teachers were predominantly female (63.4%), in the age group between 30 and 39 years old (42.8%), with graduate degrees (70.6%) and with an average of 5 years working with Senac.

Considering that, in the national average, teachers have five years of employment with Senac, and that the implementation of the Pedagogical Model began in 2015, that is, three years ago, it is possible to affirm that most respondents followed this

process since its inception. This is an important finding, because it reinforces the degree of consistency of the answers, since most of the teachers have experienced the implementation actions that have been carried out in the Regional Departments.

It should be noted that the questionnaire was also sent to CUIP teachers who at the time of the research no longer worked with Senac, but who, in the time prior to data collection, developed Integrating Projects in the Institution and, therefore, were on the Regional Departments databases. In total, 76 teachers disconnected from Senac answered the questionnaire, representing 3.4% of the total of respondents.

5. Continued training for working with the CUIP

Senac National and Regional Departments carry out permanent continuing education actions for teachers in order to sponsor the technical development and improvement of pedagogical practices.

Thus, this investigation focused on the teacher's participation in the continued training offered by the National Department, more specifically in the Teacher Training – a Distance Education extension course, offered between 2014 and 2017. In addition, in the Specialization in Teaching for Vocational Education – a Distance Education graduate course, which started in 2010 and whose content was updated after the start of the SPM implementation, and finalized in 2017.

As to the Regional Departments, the study investigated teachers' participation in workshops, study groups, courses, lectures and other strategies carried out by the Regional Department in order to address topics related to the SPM, mainly related to the development of Integrating Projects.

In the national total of the continued training actions offered by the National Department (Teacher Training and Specialization in Teaching for Vocational Education), 16.9% participated in both, 54% of respondents participated partially, i.e. in only one of them, and 29.1% did not participate in any of the training actions offered by the National Department.

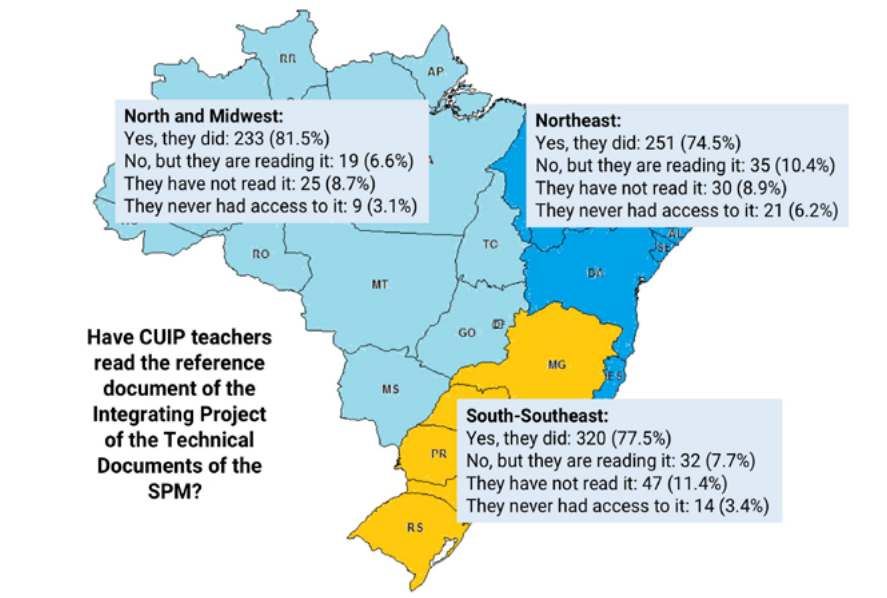
Of the continuing education actions offered by the Regional Departments, 56.9% of the teachers stated their participation. Of these, 18.3% indicated that they also participated in all training courses and 38.6%, up to two continued training courses offered by the Regional Department.

In addition to the training offered by the National Department and by the Regional Departments, the teachers also answered questions specifically about reading and studying of the *Collection of Technical Documents of the Senac Pedagogical Model*. This item was considered crucial for the analysis of the results, since the Collection is the main reference to support teaching practices on the Pedagogical Model. The study identified, specifically, the degree of knowledge of the teachers about the Collection of Technical Documents, since this material has been available since 2015 and has been continuously recommended as fundamental for the practice

of teaching at Senac. Thus, given the importance of the Technical Documents for the teaching practice within the SPM, a hypothesis was elaborated that the greater the teacher's contact with the Technical Documents, the greater the adherence of the pedagogical practices carried out in the CUIP to the premises of the Pedagogical Model. Of the total number of respondents, 73.4% reported having read the *Collection of Technical Documents of the Senac Pedagogical Model*.

Figure 2, below, shows the distribution of the teachers' answers regarding the reading of the *Integrating Project Technical Document*, divided by the Corporate Development Nucleus:

Figure 2 - Reading of the *Integrating Project Technical Document* by Nucleus



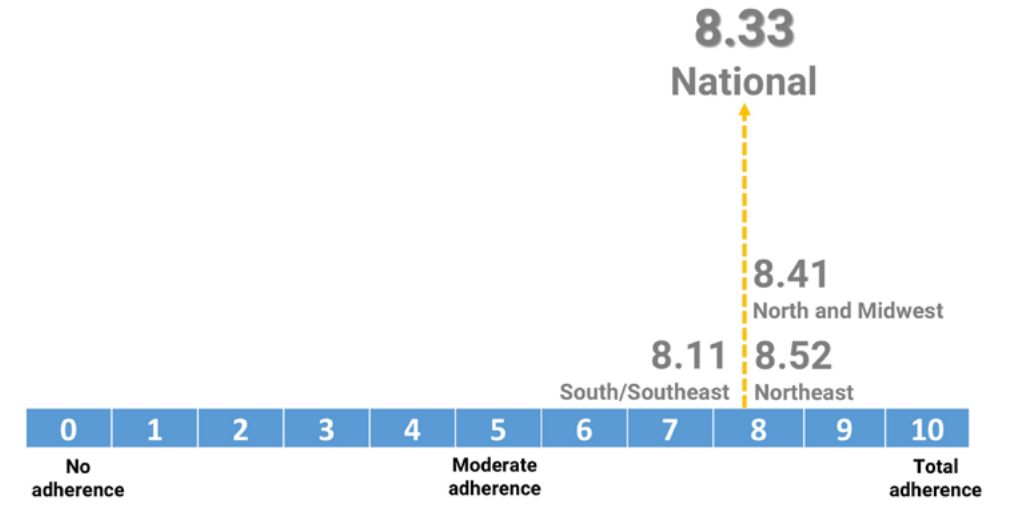
Source: Vocational Education Office, Senac, National Department.

Most teachers participated in some continued training action and read the *Integrating Project Technical Document*. This finding is an important indication that the continued training efforts, with the purpose of enabling teachers to work in the CUIP, have had enough capillarity in the Regional Departments.

6. Level of adherence of the CUIP to the SPM

Graph 1, below, presents the results for the adherence indicator to pedagogical practices carried out at the CUIP at the national level and by the Corporate Development Nucleus, using a scale ranging from no adherence – represented by zero –, to total adherence to the SPM – represented by 10.

Graph 1 – Adherence of the pedagogical practices of the CUIP to the SPM



Source: Vocational Education Office, Senac, National Department.

The result of 8.33 points presented by the adherence indicator of pedagogical practices carried out at the CUIP at the national level can be interpreted as positive for the third year of the implementation of the SPM. It allows understanding that the CUIP has been developed with a high degree of adherence to the expected parameters and in a very similar way among the Corporate Development Nucleus. Therefore, the hypothesis is confirmed that the actions of continued training and study of the Technical Document are producing positive results in classroom. Probably, the pedagogical orientation conducted by the technical teams in the Regional Departments is another variable that may have contributed to the fact that the practices of development of Integrating Projects, reported by most teachers, follow the assumptions of the SPM.

Other qualitative aspects should also be considered for the analysis of this indicator. The first is the fact, already widely debated in the literature on the Theory of Change[12], that in institutions undergoing processes of change there may be forces of resistance and cession, advancement and retreat, proper to the period in which new manners of doing are introduced in the daily work of institutions, representing a breakdown of institutional paradigms. It is worth considering, at this point, that the implementation of the SPM is still in progress, due to finish in 2019, which means that Senac is in the process of changing its pedagogical practices, and so those forces may exist, and even interfere with the operation of the Model.

Second, considering the pedagogical sophistication of the Integrating Projects, which presuppose integrated teacher planning, broad collective participation and development in all other Curricular Units composed of activities focused on the IP issues, without this representing a formal increase in the CUIP, it was to be expected that the faculty needed time for the actions of continued formation and effective practice to present sufficient maturity for the consolidation of a pedagogical routine.

These combined aspects further reinforce the perception that, in reaching the adherence observed in this indicator, the pedagogical practice of developing Integrating Projects in the scope of the Pedagogical Model is, in fact, an important qualitative leap in increasing the offer of vocational education at Senac. It is important to emphasize that the indicator presents a panoramic view of the pedagogical phenomenon, since, when analyzed in detail, it reveals points that require attention from the Regional Departments. This detailed analysis, focusing on the development dynamics of CUIPs, is presented below.

7. Development dynamics of CUIPs

The development dynamics of CUIPs refers to the report of the teachers' practice in each of the development stages of the IPs, as well as to their perception about the participation of the students and other CUs for the realization of the IP.

7.1 Integrated Planning

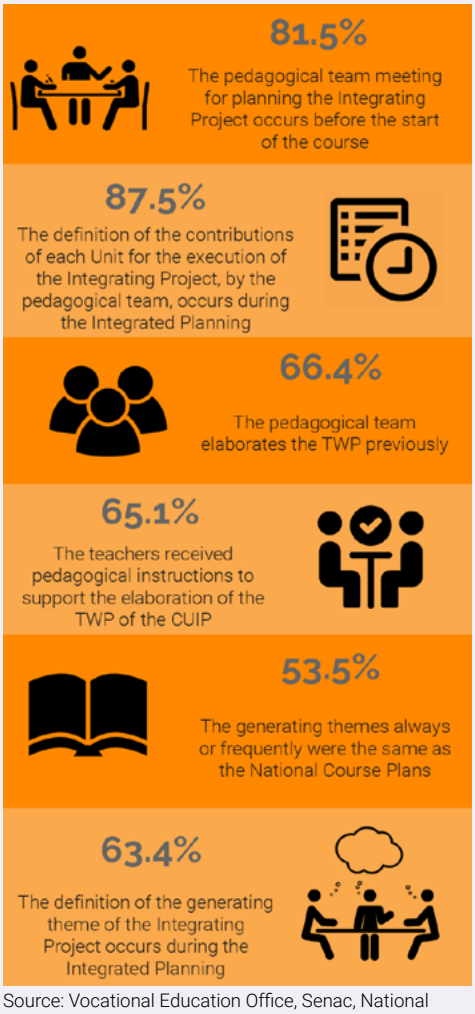
Integrated planning must take place before the beginning of classes

According to the *Integrating Project Technical Document*, integrated planning must take place before the beginning of classes, with the objective of "organizing, in a collaborative manner, the pedagogical actions of the course and the training objectives to be achieved" (SENAC, 2015e, p. 14).

The results show that this practice is actually taking place, as indicated by most respondents (81.5%). According to 63.4% of teachers, the generating theme was defined at this stage, and 87.5% of teachers stated that each CU contributed during integrated planning. These are positive aspects that reinforce the relevance of integrated planning as a decision-making and internal organization step for IP.

The preliminary elaboration of the TWP by the pedagogical team is a strategic choice of the Regional Department. For 66.4% of teachers, their TWPs were, in fact, previously elaborated by the pedagogical team. It should be clarified that, although

Figure 3 - Integrated planning according to the teachers inquired



Source: Vocational Education Office, Senac, National Department.

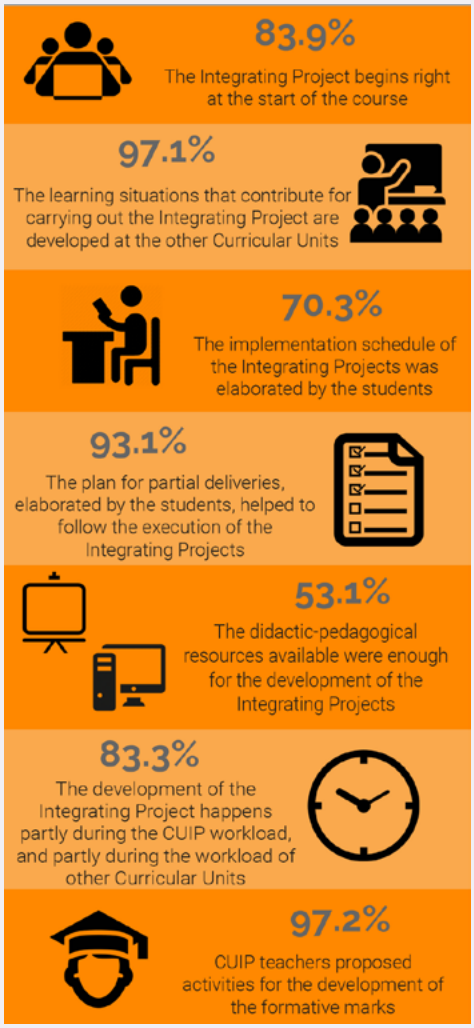
the TWP can be previously prepared by the pedagogical team to establish a quality standard of the practices to be carried out, the teacher is instructed so that the learning situations are re-planned according to the needs and characteristics of the class. This presupposes support and pedagogical guidance by the technical teams of the Regional Department.

7.2 Development of the IP

As a co-requisite of the other CUs, the IP should begin right when the course starts, and the problematization stage – carried out with the students – is the starting point for its development. At this stage, the IP theme and its challenges must be debated, organized and validated. A proposal of a schedule of activities to be carried out by the students is also elaborated at that moment. For most respondents (83.9%), in line with the guidelines, the development of the IP occurs effectively at the beginning of the course and, for 70.3%, the schedule was really made by the students.

A large part of the respondents, 93.1%, agreed that the partial delivery plans helped to monitor the execution of the IPs, and 97.2% said they had proposed activities for the development of Formative Marks, indicating that these points are being carried out successfully by CUIP teachers. However, when questioned about the adequacy of available didactic-pedagogical resources, just over half (53.1%) said they were enough, which points to something that could be improved.

Figure 4 - Development according to the teachers inquired



Source: Vocational Education Office, Senac, National Department.

7.3 Synthesis and assessment

According to the *Integrating Project Technical Document*, the synthesis is the moment when the students reflect on the route taken to solve the problems and challenges presented during the Project; the assessment happens through specific indicators throughout the CUIP.

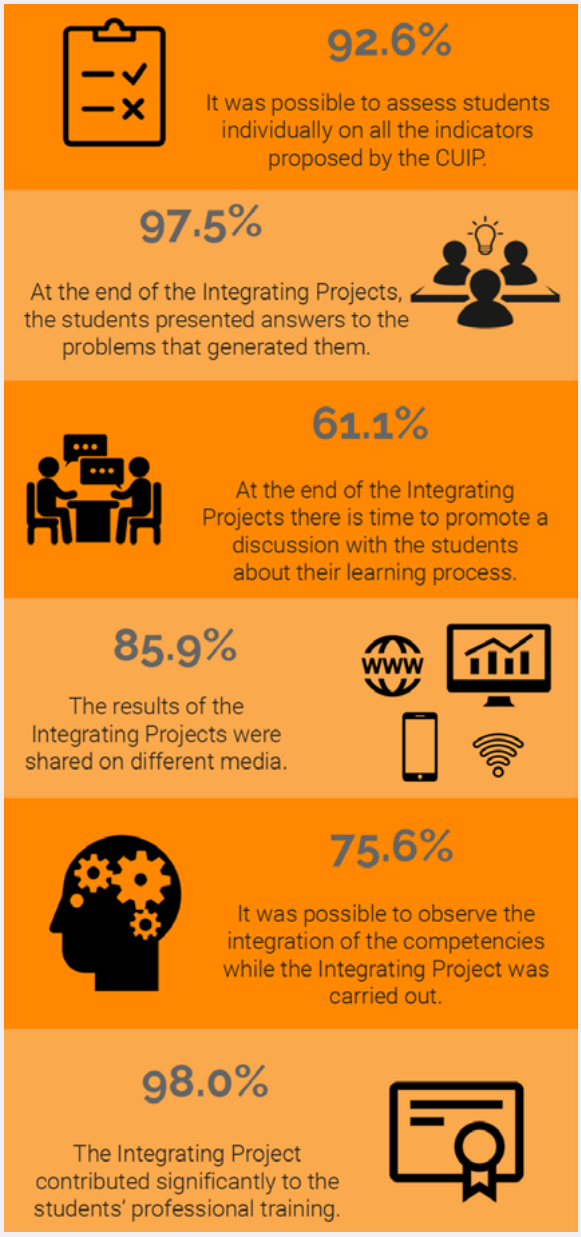
In addition to assessing students based on the indicators, teachers should also identify: evidence of the Senac Formative Marks in solving the challenges presented; the articulation of the course competences in the development of the IP; the elaboration and synthesis of the IP, responding to the specifications of the generating theme; and the presentation of the results of the IP with coherence and creativity, proposing innovative solutions based on the critical view of professionals from the segment (SENAC, 2015e , p. 21).

The results point that almost all teachers stated that it is possible to evaluate individual students using the proposed indicators (92.6%). According to 97.5% of the teachers, the students presented adequate answers to the problems and challenges; 85.9% stated that the students shared the results found on different media.

For 98% of the respondents, this pedagogical experience contributes to the students' professional training. These are important indications that the IPs were finalized and evaluated with enough quality for most teachers. However, 38.9% of them indicated that they had not promoted a discussion with the students at the end of the CUIP due to lack of time, and almost a quarter of teachers said that the integration of competencies could not be observed. These findings allow some reflections.

First, although almost all teachers stated that it was possible to carry out the evaluation following the premises of the Pedagogical Model, by not returning the evaluations and talking to the class about the development process of the IP, hearing the students'

Figure 5 - Synthesis and assessment



Source: Vocational Education Office, Senac, National Department.

considerations, the evaluation seems to have followed the more traditional route for this practice, at least for part of the teachers[13]. That is, probably, for almost 40% of teachers, the formal aspects of the evaluation practices had more weight thank the dialogue and the promotion of reflection by the students, hence the tendency of teachers to prioritize other actions and, at the end of the IP, there is no time left for the necessary analysis of the whole process.

Secondly, it is worth mentioning the percentage of teachers (24.4%) who stated that the integration of Professional Profile competencies could not be observed. Considering that integration is the major purpose of the CUIP, it is possible that interesting and satisfactory results have been achieved without the necessary articulation between the Curricular Units, when prioritizing one competency or another.

It should be pointed out that the Technical Document states that the learning experience and the articulation of the competences lived throughout the process are more important than the results themselves, with the moment of synthesis, in which students and teachers discuss the process of realization of the project, having great pedagogical importance. These possible mismatches between the pedagogical objectives and the practical results of the Integrating Project are a phenomenon that should be considered in the pedagogical guidance strategies of the Regional Departments.

7.4 Student participation

Student participation is essential for the development of Integrating Projects. Although the Technical Document instructs the pedagogical team to carry out a previous survey of generating themes, to develop a proposal for a plan of action, and to define the contributions of each CU, these aspects must be validated by the students.

Student participation is essential for the development of Integrating Projects

For 87.4% of the teachers, the validation of the generating theme of the Integrating Project occurred early in the CUIP. For 92.9%, the activities and responsibilities related to the plan of action were defined together with the students, and the same percentage of teachers stated that in each CU the students performed activities related to the IP. These numbers indicate that teachers have provided enough pedagogical conditions for student participation, with the autonomy and leadership necessary for the accomplishment of the IPs, as instructed by the Technical Document.

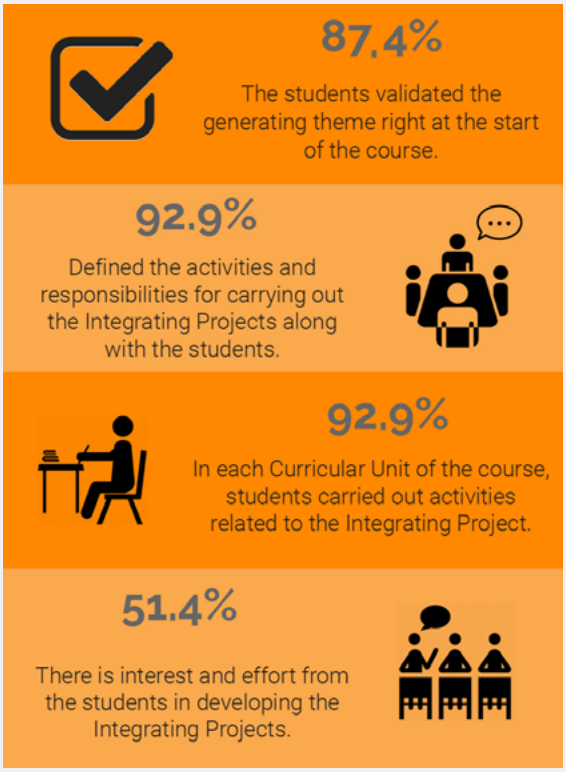
One point that deserves attention is that, when they argue about the interest and commitment of students in the development of IPs, almost half of the respondents stated that they perceived low interest and lack of commitment on the part of students in the development of this action.

The apparent mismatch between the results of the IPs and the motivation of the students can be explained by the teacher's perception regarding aspects associated to the classroom dynamics, such as behavior, discipline and interest of the students, which can affect perception on this topic. On this aspect, it is important to highlight that the Pedagogical Model, by proposing the national alignment of the curricula of

the Technical Vocational Qualification, Professional Qualification and Trade Quality Apprenticeship courses and orienting the pedagogical practice carried out in the classroom, leads to substantial changes in the way vocational education happens at Senac. It is possible that by bringing the student to the center of the pedagogical scene, the teaching action focused on the development of skills and the requirement of the collective work inherent to the realization of the Integrator Project are contributing to overcoming rooted pedagogical practices, which is probably not happening without conflict.

Still in the field of hypotheses, it is possible that this phenomenon is perceived, both by teachers and students, as an "way out of the comfort zone", considering that both subjects, to a lesser or greater degree, come from regular education systems in which educational practices with predominantly traditional characteristics still prevail[14]. This element, however, needs a comprehensive approach to be better clarified.

Figure 6 - Student participation



Source: Vocational Education Office, Senac, National Department.

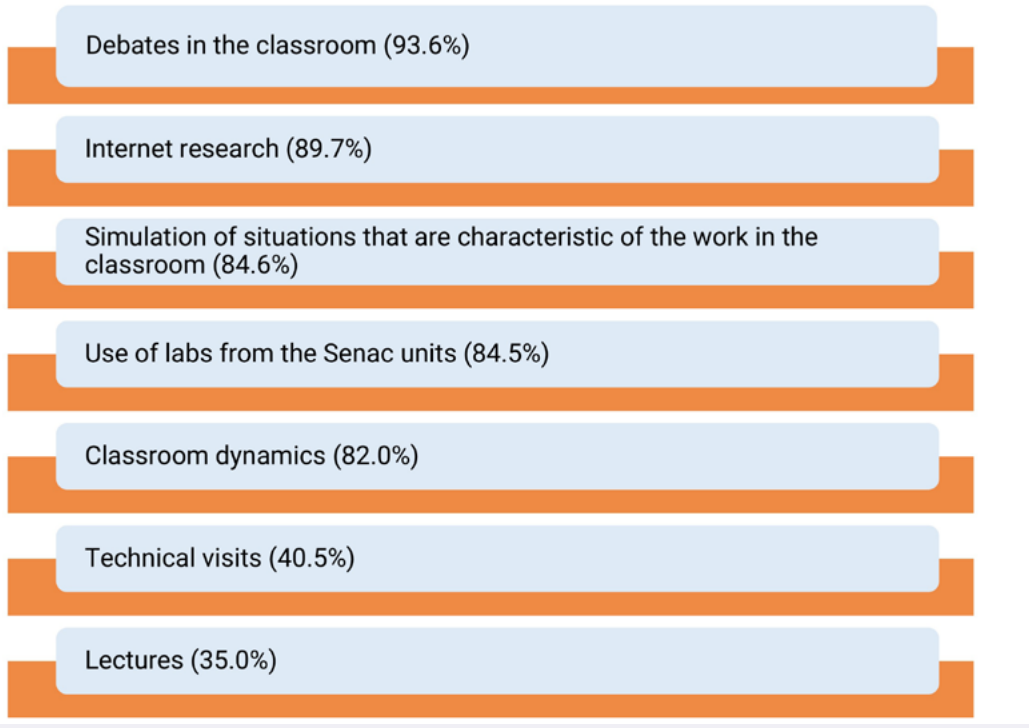
7.5 Participation of the other CUs for the IP

The participation of other CUs to carry out the IP is an explicit guideline of the *Teaching Plan Technical Document* (SENAC, 2015e). This document also states that the TWP of the CUs of a given course must contain clearly the connection between the competencies of the professional profile, its indicators, the learning situations

described and the evaluation elements and strategies, in addition to how the Curricular Unit has to contribute to the IP. This is, therefore, essential for the observance of the Regional Departments implementation teams, especially regarding the technical capacity to evaluate the quality of the activities of inputs for the realization of IP.

In this sense, 84.2% of the respondents evaluated the participation of the other CUs for the resolution of the IP as good; 14.5% as a regular; and 1.3% rated it as bad. When asked about the type of pedagogical activity most commonly used by teachers of other CUs as a contribution to the development of the CUIP, the following answers were given, shown in the following table:

Chart 1 - Main input-production activities for accomplishing the Integrating Project



Source: Vocational Education Office, Senac, National Department.

Teachers also mentioned, with less occurrence: brainstorming; dramatizations/ theater; games; mental maps; field research, and interviews.

7.6 Development of the Senac Formative Marks

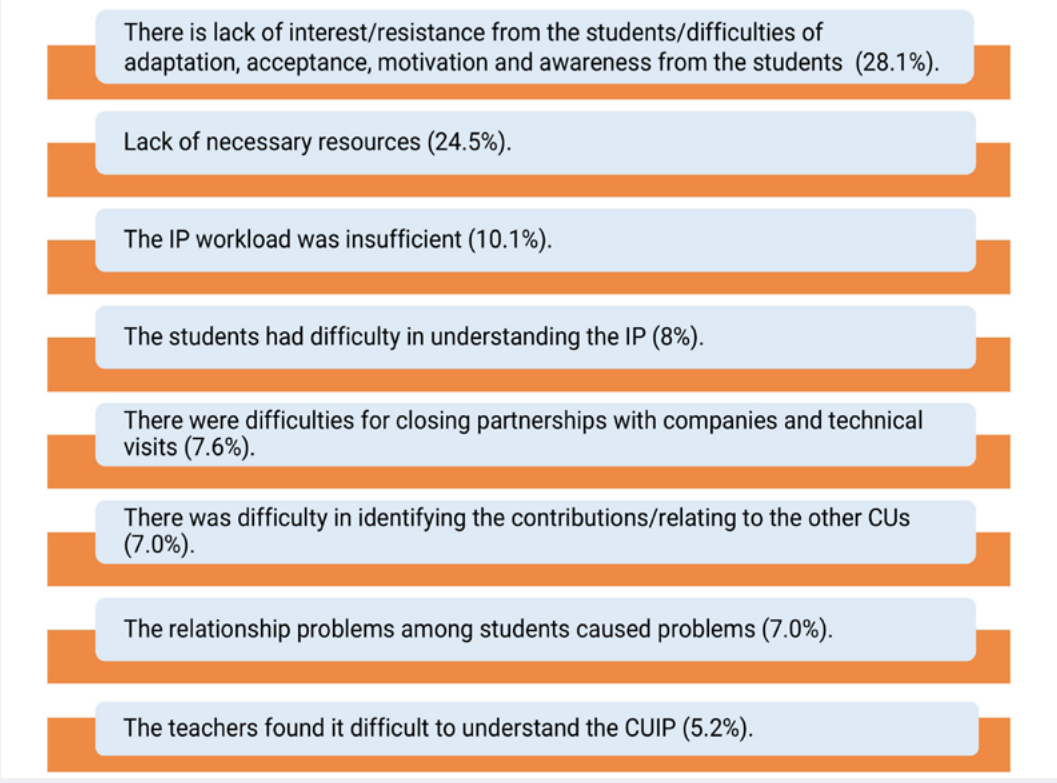
The study investigated whether activities were carried out in the other CUs to develop the Formative Marks throughout the course, as well as whether it was possible to observe their development during the IP. If, on the one hand, almost all CUIP teachers claim to have proposed activities for the development of the Senac Formative Marks (97.2%), on the other hand, 76.8% of them stated that the development of the Senac Formative Marks could be observed.

This draws attention to a possible mismatch between what is planned in terms of activities for the development of the Senac Formative Marks and what teachers actually observe from students. One hypothesis to be investigated is the understanding of evaluative practices, to verify the development of the Formative Marks in the CUIP and in the other CUs. According to the results, these teachers probably understand that the process of evaluating Formative Marks is separated from the evaluation of the Curricular Units, that is, the one carried out through the competence indicators, which can therefore generate difficulties in observing the development of the Formative Marks throughout CUIP. The way in which CUIP teachers and the teachers of the other CUs are evaluating the development of the Formative Marks is a fact that emerged during this research and that should be explored by the pedagogical teams in the Regional Departments.

7.7 Difficulties faced by the CUIP teachers

At the national level, most respondents stated that they did not find it difficult to execute the CUIP (68.4%), a perception similarly felt in the three Nucleus. In the universe of respondents who reported having perceived difficulties to develop the CUIP, when asked to identify them, the following list was reached:

Chart 2 - Main difficulties related by CUIP teachers



Source: Vocational Education Office, Senac, National Department.

In relation to the variables of teacher training and difficulty in the development of CUIP, it was detected that among teachers who said they had difficulties in the implementation of CUIP, 78 (24.2%) did not read the reference document of the IP of the *Collection of Technical Documents of the Senac Pedagogical Model*. Thirty-seven teachers from this group (47.4%) also did not participate in any teacher-training actions.

As seen previously, reading the Technical Document and participating in teacher-training actions, although associated to some degree with adherence to the CUIP, do not necessarily appear as a factor linked to the difficulties perceived by the teachers. Again, the teacher/student relationship appears in the respondents' reports, this time perceived as a factor that causes more difficulty for the development of IPs. It is clear that this points to a need for greater attention to the implementation of actions and programs that create conditions that facilitate teaching and learning situations in vocational education. However, it should also be mentioned that, to some extent, this phenomenon reflects a current picture of the Brazilian educational scenario, which presents issues of low performance and school backwardness, besides the mismatch between the interests of the students and the pedagogical practices developed in the school[15].

Considering that, by proposing practices centered on active learning methodologies, the SPM puts the student at the center of educational action, it is expected that during this moment of didactic-pedagogical transition the difficulties perceived by teachers are, precisely, relational in nature.

8. Final considerations

With a national average of 8.33 points of adherence of the pedagogical practices of the CUIP to the SPM, it is possible to conclude that the IPs, as an important action of the SPM, have been implemented satisfactorily on the Regional Departments. However, some aspects deserve special attention.

The results evidenced the importance of the continued training actions developed with the teachers, an element directly associated to the quality of the teaching practice. The challenge, therefore, is to implement actions of formative impact that have immediate use and good cost-benefit. For the Regional Departments, the Technical Reference Documents of the Pedagogical Model should be disseminated widely, and the pedagogical teams should elaborate Pre-Teaching-Work-Plans, of the teacher's CUIP and of the other CUs, since this strategy was considered an important variable for the good development of IPs.

One point that should be noted is the power of the Integrating Projects in presenting, through results, possible innovative solutions. Innovation is a value dear to Senac, therefore, it is necessary to organize strategies that promote and permanently sponsor the culture of innovation in the Institution. In this sense, the IPs tend to be a

promising path, especially if their generating themes are aligned with the real issues of the local productive sector. Other institutions that integrate the Autonomous Social Services have shown promising experiences with IPs as a source of innovation[16]. However, it is also worth noting that the results showed the potential of stimulating innovation through the IPs, the CUIP focuses on the pedagogical nature of the articulation of the competencies of the professional profile of the courses.

Finally, an aspect that needs more qualitative reflection, given the limits of this work, rests on the mismatch between the students' interest and their participation. According to the teachers' evaluations, as seen in the results, one of the main difficulties for the execution of the CUIP was the students' lack of interest and motivation. However, the teachers recognize that the students' participation is satisfactory. This contradiction should be better investigated, with the students who participated in the IPs as target audience for future approaches.

Notes

[1]This research is an inter-agency action carried out by the Prospecting and Educational Evaluation and the Educational Development Management of the Vocational Education Office of the Senac National Department.

[2]The Formative Marks are characteristics to be evidenced in the students throughout the training process. They derive from the educational principles and institutional values that govern the Senac Pedagogical Model and, thus, represent the commitment of the Institution with the integral formation of the professional citizen. As Formative Marks, it is expected that the professional trained by Senac evidences a technical-scientific mastery of their professional field, with a critical view of the reality and the actions they perform, presenting entrepreneurial, sustainable and collaborative attitudes, acting with focus on results (SENAC, 2015c, p. 15).

[3] According to the production data of Senac/DN December/2017.

[4] It integrates the *Collection of Technical Documents of the Senac Pedagogical Model*. Available from <http://www.extranet.senac.br/modelopedagogicosenac/index.html>.

[5] About assessment indicators, for Integrating Projects and other Curricular Units, see: Senac (2015a).

[6] About learning situations and Teacher's Work Plans, see the technical document *Teaching Plan*. (SENAC, 2015d).

[7] The Collection of Technical Documents was elaborated creatively, with participation from all Regional Departments. Currently, it contains nine volumes that talk about the central themes of the Senac Pedagogical Model. Available from <http://www.extranet.senac.br/modelopedagogicosenac/index.html>.

[8] Research carried out for practical purposes driven by the need of knowledge for immediate application of results (ROLL-HANSEN, 2009).

[9] The sample error is the difference between the result value obtained in the sample and the real population.

[10] Software for structuring online questionnaires and collecting answers.

[11] The answers were made compatible when the respondent was expected to disagree, totally or partially, with some assertion.

[12] About the Theory of Change, see Lima (2003).

[13] According to the *Technical Document Learning Evaluation*, returning the evaluations, the moment when the teacher discusses the results together with the student, is a point that deserves special attention to increase the quality of the evaluation. In vocational education, the return must have the goal of developing competences, and its agenda must be responding to the indicators, carried out in a precise and constructive manner. In this sense, the action of reflecting on the results with the student, analyzing with them what they gained and which aspects still have need improvement, and how to get there, contributes greatly to the full development of the competencies of the professional profile (SENAC, 2015a).

[14] The traditional approach to teaching is still common in regular schools in Brazil. In this type of approach, the focus is on the teacher, who holds knowledge and passes them on to the student, usually in lectures. The student has goals to meet within certain deadlines, which are verified through periodic assessments. From this perspective, there is a focus on student's accumulation of knowledge and success in assessments such as the National High School Exam (Enem) and the college entrance examination (CORDEIRO; OLIVEIRA, 2015).

[15] About this subject, see the Brazilian Basic Education Yearbook, available from <https://www.todospelaeducacao.org.br//arquivos/biblioteca/anuario_educacao_2016.pdf>.

[16] One example is the Senai Integrating Projects Challenge, launched by the National Service of Industrial Training in 2015. For more information, see <portaldaindustria.com.br/senai/canais/desafio-senai-de-projetos-integradores>.

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CLOSING THE FUTURE SKILLS GAP IN LATIN AMERICA AND THE CARIBBEAN THROUGH APPLIED LEARNING INNOVATION

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Abstract

The article categorizes the skills required for the future of work identified in recent researches led by the International Labour Organization (ILO), the Inter-American Centre for Knowledge Development in Vocational Training (Cinterfor) and other institutions. Then, recommends that the skills gap in the labor market of Latin America and the Caribbean can be narrowed by innovation in the Vocational Education and Training institutions. For this effort, propose that problem-based learning and quality apprenticeships pedagogies are fundamental teaching methods for student's achievement in soft skills.

Keywords: Quality apprenticeship. Vocational Education and Training. Project-based learning.

1. Introduction

The labour market of the future, as characterized by the future of work concept, will demand skills, which the students in the Vocational Education and Training (VET) system are presently not developing.

The argument in this document shows that this future of work related with skills gap is the same as the one presently and strongly affecting the Latin America and the Caribbean (LAC) region, in particular when referring to soft-skills. Given the similarity between both sets of skills, those applied by VET systems in other regions can inform the region's strategies aimed at narrowing the skills gap.

However, resistance to change as well as unstable political and economic scenarios in the region add to why innovations, and the risks they bring along, take so long to be tested and integrated.

It is nonetheless true that during the last thirty years almost all VET systems in the region have gone through minor and major

reforms. During the late 90s and until the late 2010s Vocational Training Institutions (VTIs) adopted competency based training and quality assurance approaches, which required great investments and risk-taking. Many institutions also introduced support for applied research, innovation centers, and innovative learning approaches.

Actually, since the late 2010s, some member institutions from the Inter-American Centre for Knowledge Development in Vocational Training (ILO/Cinterfor) – a technical service of the International Labour Organization (ILO) – have been introducing new strategies to match the needs of the labour market. In Brazil as in Colombia, VTIs have mainstreamed new learning approaches into curriculum with varying degrees of success in terms of actual implementation. In El Salvador, interest from the plastic sector is generating demand for apprenticeships/dual approaches. This is also true in the Dominican Republic in relation to other sectors and enterprises.

The labour market in LAC displays the widest gaps between skills supply and demand

Although people will probably not see sweeping reforms in the short run, there are many VET programs already experimenting with these two relevant innovations for the future of work and the present LAC labour market, namely, Quality Apprenticeships (QA) and Project-Based Learning (PBL).

In this perspective, the initiatives VTIs are implementing should prove that these methods are more effective for the development of soft skills; demonstrate these two approaches are complementary in methodological terms; and prove that if VET systems are expected to deliver for the future of work, both need to be applied.

2. Context

2.1 Skills gap

Economies in the LAC region have been suffering from low and stagnated productivity for quite some time now (ECLAC, 2012). According to the Organisation for Economic Co-operation and Development (OECD) all involved actors recognise that the workforce often lacks the right skills, an argument particularly supported by employers and seen by them as one relevant cause for the region's productivity woes (MELGUIZO; PEREA, 2016).

The same OECD report indicates that of all economic regions in the world, the labour market in LAC displays the widest gaps between skills supply and demand. This finding is supported not only by reports from other think tanks – Economist Intelligence Unit (EIU); consultancy firms (McKinsey, ManpowerGroup); and multilateral development banks, like the Inter-American Devolopment Bank (IDB) and the Development Bank of Latin America (CAF) –, but from research carried out by governments and public institutions from the region (VARGAS ZUÑIGA; CARZOGLIO, 2017).

Given that the region has traditionally been an importer of technology and production processes one can be tempted to believe this gap is mostly made of skills related to specific machinery, materials or processes. Although this is still true, it misses a big part of the issue.

The set of skills presently in demand, which workers seem to be lacking, now include soft skills and count as much as the technical skill-set. The studies carried out by the National Apprenticeship Institute (INA) in Costa Rica and by Chilevalora in Chile (CALVO SANTANA; COTO CALDERÓN; VARGAS JIMÉNEZ, 2016; COMISION DEL SISTEMA NACIONAL DE CERTIFICACIÓN DE COMPETENCIAS LABORALES, 2015) confirm the previous assertion. In these studies, employers identify teamwork, assertive communication, lifelong learning, autonomy, adaptability and conflict resolution as main skills all the workforce is lacking.

It is important to note that VET systems are not entirely responsible for the existing skills gap. The region suffers from serious deficits in basic skills that should have been acquired before the student enters the VET system (BUSSO; AMBRUS, 2016). On the other hand, much of tertiary education offers learning of dubious quality (CASTRO; NAVARRO, 2016). Finally, enterprises may not always be allocating the right skills to the right position (OECD, 2018).

2.2 Skills for the future, now

In 2016, ILO/Cinterfor carried out a study aimed at the identification of the skills required for the future of work, in order to inform its member institutions (CINTERFOR, 2016). During this process, reports from the IDB, the World Economic Forum (WEF), the OECD, the EIU and the partnership for the 21st century learning (P21) were analysed and systematized.

The study identified about 40 different skills, which align with the ones identified by INA and Chilevalora. For the purpose of this document, comparing the sets of definitions in order to build the following two tables describe how these future-demanded skills are part of the ones indicated by INA and Chilevalora.

Table 1 - Correlation between soft skills for the future of work and those identified by INA

INA	IDB + WEF + OCDE + EIU + P21
Teamwork	Collaboration + Communication + Decision-making, emotional intelligence, negotiation, service orientation, personal responsibility.
Autonomy	Personal responsibility, research, problem resolution, critical thinking.
Assertive communication	Communication.
Relationship development	Life and career, local and global citizenship, communication, collaboration, critical thinking.

(to be continued)

(continued)

Professionalism	Personal responsibility, service orientation.
Conflict resolution	Communication, emotional intelligence, negotiation, social responsibility, critical thinking, people management.
Disposition	Personal responsibility, life and career.
Adaptability	Adaptability, critical thinking, cognitive flexibility, research, creativity and innovation.
Orientation to quality	Productivity, personal responsibility, creativity and innovation.
Continuous learning	Learning to learn, metacognition, critical thinking, cognitive flexibility.
Leadership	People management, communication, decision-making, emotional intelligence.
Resource management	Financial and economics knowledge, productivity, people management, personal responsibility, environmental consciousness.

Source: Own depiction.

Table 2 - Correlation between soft skills for the future of work and those identified by Chilevalora

Chilevalora	IDB + WEF + OCDE + EIU + P21
Communication	Communication
Teamwork	Collaboration + Communication + Decision-making, emotional intelligence, negotiation, service orientation, personal responsibility, local and global citizenship.
Problem resolution	Research, critical thinking, creativity, innovation.
Continuous learning and initiative	Adaptability, learning to learn, metacognition, critical thinking, cognitive flexibility, creativity and innovation.
Personal effectiveness	Personal responsibility, service orientation, decision making.
Safety and self-care	Personal and social responsibility.

Source: Own depiction.

Even if there were to be slightly different interpretations for these definitions, communication, collaboration, adaptability, lifelong learning, critical thinking, creativity and innovation, personal responsibility and decision-making seem to be in demand by today's labour market and the one of the future.

VET systems have to systematically start developing these skills right away, the labour market needs them and given that the fifteen-year-olds VET students will be twenty-seven by 2030, if the region is to profit from its demographic bonus (INTERNATIONAL LABOUR OFFICE, 2013), they need to be equipped with these skills by then.

2.3 Teaching and learning are not the same thing

VET systems in the region have been slow to acknowledge this new scenario, probably because enterprises have only recently started to see the value in soft skills. This has slowed down the push towards the introduction of innovations in the design and delivery of VET.

To this day, most learning design and delivery in the region follow traditional approaches where teacher and content remain the centre of instruction. Lecturing and assessment of fact retention are still a widespread practice.

Another innovation that would help narrow of the region's skills gap is Quality Apprenticeships

Even in vocational training, where curriculum design is competency based, integrating knowledge, skills and attitudes, soft skills tend to be taught as independent and content wise topics while technical knowledge is still mostly taught in the frame of the artificial theory/practice dichotomy. Furthermore, the trade is taught as independent modules, which limits the development of an integrated understanding of the future work environment, structure and processes.

There is nonetheless hope; a growing number of VTIs are experimenting new approaches to learning. The National Training Service (Sena) from Colombia has instituted a project-based approach for all its curriculum design since the year 2007 (RINCON, 2018). The National Service for Commercial Apprenticeship (Senac) in Brazil has introduced a similar approach and has been applying it across the board since 2015. SNA Educa in Chile has recently started PBL pilot projects in 15 learning centers. The National Institute of Technical - Vocational Training (Infotep) in the Dominican Republic is starting a pilot programme this year (2018) and in 2014 Guatemala's Technical Institute for Training and Productivity (Intecap) introduced project-based learning as a base methodology for the development of meaningful learning.

Another innovation that would help narrow of the region's skills gap is Quality Apprenticeships. The region has a lot of long-standing legislation on apprenticeship contracts, which attests the interest of VET systems in this approach. However, in most of the region, even in countries with solid VET systems as Brazil, Costa Rica or Peru, the penetration of the apprenticeship approach stands at a meager 1-3% (VARGAS ZUÑIGA; CARZOGLIO, 2017).

Among the many variables that help explain these low levels of engagement in apprenticeships are enterprise, union culture, government labour policy, macroeconomic instability and again, the lack of work readiness VET students tend to show.

Given these skills deficits, the hiring of apprentices may become more a problem instead than a benefit. This scenario makes many enterprises weary of engaging in apprenticeships. For example in Colombia, where the law establishes the number of apprentices enterprises should hire is established, many prefer to pay a fine for each non-hired apprentice instead of hiring one.

Many of the conditions, which hinder the adoption of apprenticeships, should find adequate responses in the ILO/Cinterfor quality apprenticeship approach (AXMANN, 2018). Many of the member institutions are requesting technical cooperation in this field. This is nonetheless the focus of this document. This paper only aims at analysing the role of learning innovations in the narrowing of the skills gap affecting the region.

In summary, the LAC region has been suffering from serious productivity stagnation and one of the causes is the skills supply and demand mismatch. In particular, concerning soft skills, one reason for this scenario is that VTIs still rely on traditional learning approaches, which are weakly linked to the reality of the world of work and do little to compensate learning deficits students bring from their previous formal schooling. In order to bridge this problem, VTIs are experimenting with learning innovations, which need to become mainstream.

3. Methods for the narrowing of the skills gap

Being the LAC region the most unequal in the world, access to quality education has remained largely a benefit for the few. Recently the number of students attending formal education has seen a dramatic increase; however, the impact on learning outcomes has been sluggish (BUSSO; AMBRUS, 2016).

The organization of work has been changing for the last forty years and it will continue to do so by demanding new skills, which traditional approaches to learning have and will not be able to deliver.

It is in fact striking that those who did well under the traditional teaching approaches and suffer from this lack of soft skills. The failure of educational systems to cope with change and provide workers with tools to adapt and continuously learn has prompted a call for a reskilling revolution (WORLD ECONOMIC FORUM, 2018).

A reskilling revolution may work for adults already integrated in the labour market, but it would be a loss of time and effort to educate and train the younger generations through traditional approaches just to find that sometime later their skills are outdated and there is need for a second reskilling revolution.

It would be a loss of time and effort to educate and train the younger generations through traditional approaches

The kind of education, which yesterday helped develop successful adults for the labour market, which failed them in this new scenario should not be the one offered to younger generations.

The following subsection will focus on two learning approaches; QA and PBL, which when thoroughly applied to foster the development of the demanded soft skills.

3.1 What is the meaning of Quality Apprenticeships?

Quality Apprenticeships is a unique form of vocational education/training, combining on-the-job training and school-based learning, for specifically defined competencies and work processes. QA is regulated by law and is based on a written employment contract with a compensatory payment and standard social protection coverage. A formal assessment and a recognized certification come at the completion of a clearly defined period of training. Apprenticeships combine: (a) gaining professional experiences that are directly applicable at workplaces; and (b) learning applied knowledge and skills that enable apprentices to understand the logic behind the jobs tasked with, cope with unpredictable situations, and acquire higher level and transferable skills.

Other work-based programs exhibit some but not all of the characteristics of apprenticeships, notably duration, assessment and certification (see Table 3).

Table 3 - Attributes of Quality Apprenticeship (QA) and other Workplace-Based Training

	Wage	Legislative framework	Programme of learning	Off-the-job training	Social Security	Formal assessment	Recognized certification	Duration
Traineeship	Maybe	No	No	No	Yes	No	No	12-24 months
Internship	Maybe	No	No	No*	No	No	No	3-6 months
Informal apprentice-ship	Pocket money/ in kind	No	No	No	No	No	No	Variable
Industry attachment	Yes	Maybe	Maybe	No	Maybe	No	No	
QA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Fixed 1-4 years

Source: Adapted from ILO (INTERNATIONAL LABOUR OFFICE, 2012).

* Some interns are studying at universities/graduate schools while doing an internship.

Despite the clear advantages of the attributes of QA – as shown in the Table 3, which make it the "Gold Standard" in vocational education and training – there is still resentment against apprenticeships, which can be summarized in the following three points of mistrust in quality apprenticeships:

Myth 1: Apprenticeships are only for advanced economies

Austria, Denmark, Germany, Switzerland, and some other European countries as well as Australia are known for well-established traditions of apprenticeships. It may thus seem that only advanced economies can implement apprenticeship schemes.

Of course, this is not true, as can be seen clearly from building blocks of quality apprenticeships in the toolkit. In fact, ILO/Cinterfor is supporting many QA initiatives in middle-income like Brazil, Costa Rica, Jamaica, and Mexico as well as in some low-income countries like the Dominican Republic.

Myth 2: Apprenticeships are only for men

Apprenticeships are associated with traditionally male-dominated trades (e.g. technicians, carpenters and plumbers). In reality, apprenticeships are offered in a wide range of fields such as agriculture, manufacturing, finance, business administration, law, media, and healthcare. In fact, many young women participate in apprenticeship programs. Statistics show that about a half of apprentices in Denmark and the United Kingdom are female. The share of female apprentices is over 40 percent in Germany, Indonesia, Italy and Switzerland (INTERNATIONAL LABOUR OFFICE, 2012).

Myth 3: Only large companies can offer formal and quality apprenticeships

Although it might be true that large companies have higher capacity (e.g. more staff members who can mentor apprentices, more budget for training, more modern equipment) to offer apprenticeship positions, small and medium-sized enterprises (SMEs) do not shy away from offering apprenticeship programs. In fact, the vast majority of apprenticeship programs are offered by SMEs, for instance in Austria, Germany and Switzerland. SMEs join forces with local schools and take in apprentices. Policy support for SMEs is important.

3.1.1 The benefits of apprenticeships

Thus, the benefits of apprenticeships are multi-fold and they accrue to all stakeholders:

- **Facilitate school-to-work transition**

Securing the first job can be really challenging for young people. One reason for this is that employers, not only in LAC, are reluctant to hire young people whose productivity is unknown because it is difficult for employers to fully apprehend technical and soft skills of young jobseekers during a recruitment process.

Apprenticeship programs allow employers to train the workers their enterprise needs while apprentices have the opportunity to demonstrate his/her productivity potential to employers as well as making well-informed choices about education and training.

- **Apprenticeship makes good business sense**

Companies invest in apprenticeships because it is sound business; a skilled workforce enhances productivity (LERMAN, 2014). The benefits amassed to businesses far outweigh the initial challenges of new apprentices who require more supervision and coaching. Companies recover the training costs, accrue net benefits as apprentices learn the trade, and become productive. Importantly, companies can also save recruitment costs since apprentices have lower turnover rates.

- **Cost-effective delivery of vocational training**

Finally, the costs and effort required for training institutions to catch up with fast-changing technologies and ever-changing skills demand are substantial. Anticipating future skill needs, equipping vocational schools and training centres with the latest facilities and tools, updating curricula and training modules as well as re-training instructors easily inflate the costs. Partnerships between training institution and industry allow the former to tap into resources of companies (e.g. equipment and facility, accumulated expertise) and the latter can also benefit from the partnership as discussed above. Government actors in charge of vocational education and training may wish to explore opportunities to utilize existing resources before embarking on costly reforms of the VET sectors in Latin America.

- **Reduction of the skills gap through direct action and spill over effect**

Apprenticeship schemes are a systematic means of forging collaboration between VET providers and industry. Employers are often critical of the skills of job seekers, ascribing it to a mismatch between education and their needs. In order to help ensure that new recruits are "job ready", companies need to be much more actively involved in training, ideally through collaboration with local education/training institutions in the design and delivery of curriculum/training modules.

Given the high rate of apprentices that remain in the enterprise once the apprenticeship is over, it seems clear that for those enterprises and apprentices the skill (specific and soft) gap was significantly reduced. It follows that a strong boost in apprenticeships would naturally help narrow the skills gap.

The apprentice holds a wide range of soft skills

On top of that, apprenticeships require apprentices who are mature enough (VAN BUER, 2013) to actually benefit from this kind of programs. Being apprenticeship-ready implies that the apprentice holds a wide range of soft skills, which need to be developed either by pre-apprenticeship processes or by the VET system.

Quality apprenticeships are mechanisms that systematically bring education and training institutions and industry closer, thereby reducing skills mismatches and skills gaps.

3.2 Project-based learning

PBL is a form of Inquiry-Based Learning (IBL), an approach that aims at students building their own knowledge through research and observation (OGUZ-UNVER; ARABACIOĞLU, 2014). On top of these strategies, in PBL the student learns through a process of analysis, planning, development and testing a solution for a real world problem. It dates from the beginning of the 20th century but only gained momentum during the 70s in Northern and Central European countries (KNOLL, 1997).

PBL is a formal tool to put into practice many of the benefits constructivism brings to learning. Many American pedagogy theorists like Merrill, Jonassen, and Kolb have

also aligned with the main principles of working via projects (JONASSEN, 1999; KOLB, 2000; MERRILL, 2002).

Although it is difficult to give only one definition of what PBL means, its main characteristics are:

- Learners are challenged via a driving problem for which they must find a solution.
- The problem at hand must be realistic and require a realistic response.
- Learners must carry out research to understand the problem and to build solutions.
- Learners organize and schedule their own activities up to a certain degree.

Other threads of PBL have added quite consistently the following characteristics:

- Projects are carried out by groups of learners and not by individuals alone.
- In courses and programs linked to trades and careers, projects should follow stages and methods used by that industry.
- Actors, external to the learning process and experienced in the trade should assess the project advance and results regularly.

Although there is little formal research before the 90s and its quality is very heterogeneous, results support the thesis of IBL being more effective for the development of soft skills (THOMAS, 2000).

More solid evidence regarding effectiveness comes from research that confirms that active and meaningful learning is more effective than the traditional theoretical-practical approach via lecturing (PRINCE, 2004).

3.2.1 Soft-skills related benefits of PBL

Students develop communication and collaboration skills through teamwork, by presenting results and jointly assessing the project and learning process. They also need to interact with people and roles outside the learning process where they exercise communication skills according to the interlocutor and context. They can even face the need to collaborate with the client in order to better establish the problem at hand and get feedback on their progress.

Critical thinking skills are exercised through the need to research and contrast information, validating information sources and assessing their peers work. Students also assess the results of their work in relation to decisions taken earlier, which trains cause-effect analysis. They also need to understand the various variables affecting their area of work and/or productive sector.

Creativity is a need for problem solving. These skills are developed through context analysis, design and implementation of solutions for real trade-related problems as well as for smaller technical and project management related issues along the way.

One issue remains at large, however. How is PBL better than traditional designs at developing soft skills? Students will not spontaneously develop these soft skills unless into learning design and teacher training.

PBL generates didactic opportunities to develop critical thinking, communication, collaboration and problem solving through research, reflection, teamwork and decision making activities. Nonetheless, these activities need to be designed carefully and rely on teachers who can methodologically support them.

This section has shared short descriptions and the benefits the suggested approaches would bring in order to deal with the soft skills gap. The next one will now discuss some issues and one strategy for the process of integrating both innovations into the VET systems in the region.

4. How to go about integrating QA and PBL into VET

Given that both described approaches (QA and PBL) would help narrow down the soft skills gap, how VET systems should integrate both of them into the region? Furthermore, would there be any challenges for their joint adoption?

As told before, many institutions have started to try out these innovations, however, even if it varies, internal resistance has been identified everywhere. VTIs should integrate these approaches in phases, which should help break down resistance by demonstrating their benefits, and the organizational changes required for a successful implementation. One suggested sequence of phases for one of Cintefor's member institutions in Central America follows:

Phase 1: On demand by a specific enterprise or sector, VTIs must establish a specific agreement that follows the QA approach. Enterprises should be the ones requesting QA and VTIs should make sure that all social partners are engaged so that social dialogue can take place and provide the ground for building the pedagogical process. VTIs should carry out these initiatives as differentiated programmes from those running the VET system so to get less attention and thus resistance from the system's *status quo*.

Phase 2: The QA initiative will require specific pre-apprenticeship efforts on top of their VET experience so that to-be apprentices can level in mathematics and language as well as to develop the soft skills required to be apprenticeship-ready. These efforts should include a project-based learning approach, which as we have seen is the most effective for the development of soft skills.

If this phase is run-thoroughly, enterprises will acknowledge that in terms of soft skills, workers coming from the labour market or the VET system had actually better prepare apprentices. The VTI should thus make clear that this happens because of the learning approach used in the pre-apprenticeship efforts.

Phase 3: During the previous phase, the institution would have already developed expertise in PBL training delivery as well as PBL supported QA. At this point, the institution must invest in building a core PBL + QA pedagogical team and the creation of a training of trainer package.

Overall infrastructure, administrative and teacher training needs would have also been identified and this knowledge should be integrated into a change management document guide. The administrative team in charge of this must conform a second PBL + QA change management team. Both teams and training packages are the base for the mainstreaming of the QA + PBL approach.

Phase 4: Mainstreaming takes place through training of trainers and institutional interventions aimed at adjusting administrative and infrastructural conditions. In order to support this process, the institution should carry out workshops where teachers and instructional designers develop PBL interventions while bearing in mind competency profiles and curriculum designs, provide a knowledge base of projects and course design and continuous training and report on the results of the methodology.

The existing soft skills gap in the region closely matches the skills gaps identified for the labour market of the future

Cinterfor suggested these phases for one specific institution in one specific moment, and may thus be subject to changes depending on more contextual analysis. The overall structure is nonetheless one where all the relevant actors in a LAC VET system would engage before trying to implement changes of such magnitude.

Through this process, employers would be on board due to their interest in better a more effective workforce. Unions and government would be on board due to their natural obligations with the worker/student and with productivity and development, in the frame of constructive social dialogue. Once all three parts, which compose the institution's board, are aligned with these changes, institutional resistances can be addressed.

There are other situations, where institutions are more open to change or where the top-down approach can be applied from the beginning. These scenarios, which are more favourable for the introduction of innovations, should nonetheless approach this change process from a social dialogue perspective in order to be (more) sustainable.

5. Final considerations

As mentioned previously, the existing soft skills gap in the region closely matches the skills gaps identified for the labour market of the future at a global level. It follows that identifying VET approaches for the closing or narrowing of the present region's skills gap becomes the same exercise as looking for tools to narrow future of work skills gap.

The analysis and sharing of two approaches have proved effective in the development of soft skills. On the one hand, Quality Apprenticeships for school to work transition, on the other project-based learning for all things VET.

Ideally, project-based approaches should support quality apprenticeships, at least during pre-apprenticeship efforts, but probably during the whole apprenticeship. On top of that, it would be safe to say that medium-term rates of apprenticeship participation in the region will not exceed 20%. If 80% of students were expected to also be able to display the right soft skills when leaving the VET system, PBL should be applied across the board and not only during QA activities. Therefore, at least in the LAC region, QAs needs PBL and the labour market needs VET to thoroughly implement both approaches.

In 2019, among other activities, Cinterfor plans to support Infotep in its pilot QA and PBL programs design and implementation and publish with Senac results of research over instructor strategies for teaching and assessing soft skills. A book containing a regional review of the use of PBL in VET in the region is also to be published. In addition, Cinterfor will start the joint development of a PBL implementation toolkit for VET for Latin America.

Further research should be carried out in order to understand at least two variables, which hinder the implementation of these approaches at the pre-apprenticeship level; (1) the effect of Competency Based Teaching (CBT) design in learner-centered teaching and (2) the effect of teacher turnover in the sustainability of these innovations.

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PEDAGOGICAL MODEL LEARNING BASED ON PROJECTS FOR A CONTEXTUALIZED TECHNICAL TRAINING

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Abstract

The article unveils the experience of installing and implementing the Project-Based Methodology (PBL) in technical education professional centers in Chile. It has enabled the systematization of practices targeted at the improvement of quality education, thus building a pedagogical model that can be replicated. Furthermore, a few preconceived pedagogical actions were described, which were key in order to enable students to learn in diversity, working with others, encouraging their emotional, personal and intellectual growth.

Keywords: Project-Based Learning. Technical and vocational intermediate education. Active learning methods. General Training. Differentiated training.

1. Introduction

Diversity is an element which formal schooling training has delayed over time, and, as a result, it is unequal, although everyone has access to it (CUBERO, 2008). This structure is a reflection of certain cognitive and cultural patterns specific to their authors, leaving out a considerable number of culturally diverse people, causing a reverse desired effect, and increasing the distance within the educational system.

This requires teachers to modify their pedagogical practices, and steer them to the integration of each students' singularities (LÓPEZ, 1997), in order to create effective links between their cultural background, with the contents that must be addressed in the established programs, therefore creating a meaningful learning (ONTORIA, 1999).

This enhanced scenario for a global, interconnected world requires changes in the way teaching work is developed with students, making it necessary to include strategies and methodologies that enable the participation of children and young people into the teaching-learning processes, fully developing their capabilities. That is how the teaching-learning active methods, such as the Cooperative Work and Project-Based Learning (PBL) become a relevant and effective answer for the creation of lasting lifetime learning in larger diversity contexts.

These methodologies foster the ultimate educational goal: to ensure everyone lives up to their potential and talents, regardless of each one's personal, socio-economic and cultural situation, in order to develop their cognitive and affective abilities, so that they can think reflexively and solve their own problems, hence allowing them to improve their quality of life.

The Chilean schooling system is not detached to this diverse and global reality, and it is taking charge of it in all educational levels during the 12-year mandatory education, where the last two years are the differentiated cycle that offers two possible schooling paths. In one side, the Scientific-Humanistic High School, and, in the other, the Technical-Professional High School.

The project approach makes possible to combine vocational education to the methodology applied by teachers

The Technical-professional High School, in Chile, with a trajectory of over 100 years, presently comprises 39% of last year's school registration, whose purpose is to graduate young people in a specific work field, turning it into a initial preparation area to the workforce, and, largely, an alternative for a unified education to adult life.

This preparation is built as a curriculum that combines the control of technical competences or peculiar to the specialty (Differentiated Education) with transverse competences and the contents of Intermediate Education General Training. It requires a teaching-learning interdisciplinary process between the two types of education, aiming to develop competences, which will allow students who choose this category to properly integrate in society through work field or continuing education.

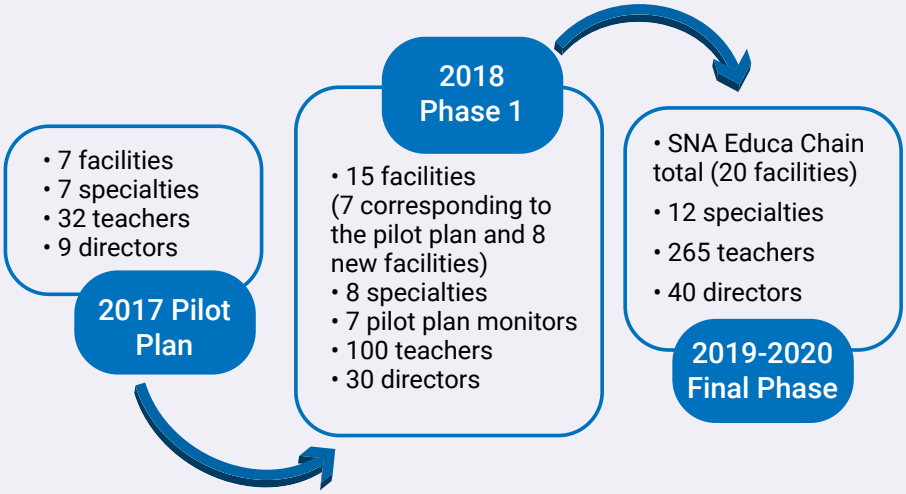
The project approach makes possible to combine vocational education to the methodology applied by teachers. This encompasses, among other topics, the definition of common objectives to different areas involved, and the building of a plan according to time, means and available resources to the development of each project.

The Agriculture National Society (SNA Educa) aspires to graduate whole people, with a clear, worthy education, defined entrepreneurial capability and competence to face new situations and solve problems, in both personal and professional fields. This agenda emphasizes the use of technology, global vision and proactivity as core competencies, achieved through the General and Differentiated training programs.

The SNA Educa Educational Corporation, with its 42 years of expertise in the Technical-Professional Intermediate Training, with emphasis in the rural sector and in vulnerability contexts, presently manages a Chain of 20 educational centers with ample coverage in the entire country, which shelters more than 11.000 young people trained in several specialties mainly related to the following sectors: Agricultural, Industrial, Food, and Mining.

The Pedagogical Model carried out at the SNA Educa facilities is based on the student's leadership, which entails a structure including different organization levels, beginning with the equipment, design and infrastructure distribution, up until the teacher-student interaction, and all the above items being focused in an effective, integral student development, therefore enabling their future work placement, the development of a company or a study search.

Figure 1 - Progression system to the PBL methodology set up in the SNA Educa Chain



Source: Own depiction.

Given that the PBL Methodology is an important answer to the education challenges faced by SNA Educa, it was decided, as an strategic guideline, to gradually set it up in the chain educational centers, as shown in the previous system.

Next is the two-year experience to set up and implement the PBL methodology in 15 SNA Educa technical-professional education centers in Chile.

2. PBL set up at SNA Educa centers

The new school context within a global world contrasts with the classic educational, standardized individual and simplified reality process (LÓPEZ, 1997), whereas, in the world, the exact opposite occurs, society becomes more complex, which requires new challenges to the teaching processes; as a consequence, people should be

more trained starting at their own capabilities and cultural features in connection with their reality to be actively encased in a dynamic and systemic world.

In this scenario, the active methodologies become more relevant, since they favor that the students assume a leading role in order to learn and develop themselves. This change in the teaching-learning process provides an opportunity so that young people can develop the skills required by society, becoming reflective, creative, technical knowledgeable, capable of learning throughout life, cooperatively working and effectively communicating.

The transverse competences contribute significantly to the personnel development

These changes represent challenges to the educational system in the development of flexible skills or transverse competences, and, already in 2008, Wanger - co-director of the "Leadership changes" group at Harvard - has identified seven basic abilities in order to one's acclimation to the new work scene: critical thinking and problem solving; cooperation through networks and leadership by influence; agility and adaptability; initiative and entrepreneurial mind; effective verbal and written communication; access to and analysis of information, curiosity and imagination.

This opinion also finds support at Davos Forum, which identifies the 10 Best Skills for workers in 2020 as: complex problem solving, critical thinking, creativity, people management, coordinating with others, emotional intelligence, judgment and decision making, service orientation, negotiation and cognitive flexibility.

The capabilities to make decisions, stress management, flexibility, initiative or motivation are attributes that will enable students to develop in an organizational environment, beyond the technical knowledge. The transverse competences contribute significantly to the personnel development and directly influence employability, being one of the main central points in job interviews and selection processes.

In short, it is possible to combine these new demands in the training of technicians in:

1. Learning to learn. It is the ability to independently train throughout the years.

2. Adjustment. It is the ability to develop oneself in different work environments, benefiting from all the capabilities in several contexts (of companies, sectors or countries).

3. Team work. Knowing how to adopt a positive role, putting knowledge and personal capabilities to work for a job in which several workers are involved and efforts are combined, leadership capability and other aspects are created.

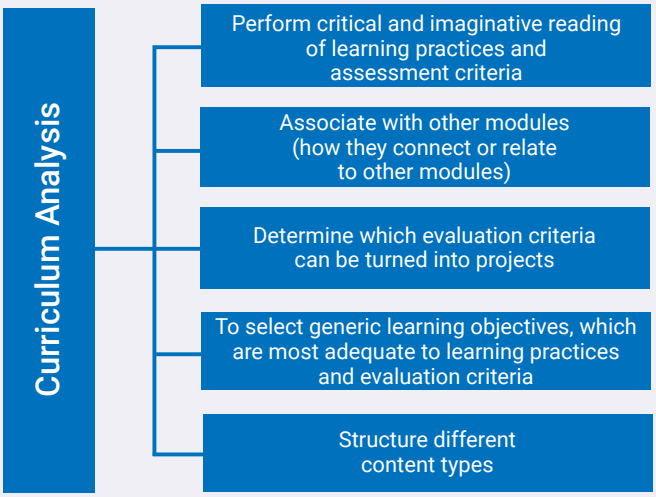
4. Resolution. Applying logics and make decisions in different contexts, evaluating decisions and being able to troubleshoot errors. It includes project management with employees.

Project-Based Learning is not a recent methodology; on the contrary, one of the most well known milestones was in the early 20th century, with William Heart Kilpatrick in 1918, with the publishing of his work "The methodology of projects". However, it seems that their use today makes more sense in pedagogical practice, as it creates a more active participation of students and, consequently, their greater involvement (without often being aware that they are experiencing a significant teaching-learning process).

On the other hand, the PBL contributes and becomes an opportunity to recognize the subjects of General Training and Differentiated Training (Technical). This makes feasible to focus on pedagogical actions based on common and additional learning, benefiting a lasting learning acquisition, promoting a challenging education, attached to the needs and features of the students, connecting them with the real world through a project. This causes major motivation and autonomy of students, as well as essential skills such as research, cooperative work and problem solving, so necessary to properly approach their job placement or additional studies. Interdisciplinary work around a project also becomes a case of open and flexible collaboration among teachers, which provides learning spaces that enable the fullest development of each student's skills and work teams.

The implementation of the Project-Based Learning methodology at the center proposed that each facility would take a leading role in the process. In other words, it considered as focal point that the facilities had autonomy in each of its stages, from the analysis and curriculum review, training and updating of teachers and the preparation of teaching materials and evaluation instruments, among others.

Figure 2 - Diagrama de análise curricular para implementar a ABP na Rede SNA



Source: Own depiction.

Addressing the set up of Project-Based Learning in the institution facilities knowingly as pedagogical strategy answers to the fact that this approach, in addition to adapt particularly well to this training demand, since it enables the solely technical, combined development of transversal skills, promotes a positive attitude in students regarding learning and training.

Next, the actions that were determining in the PBL methodology implementation as a teaching learning approach in each of the educational centers:

a. Building of a team of teachers and selection of learning objectives to work with. At each educational center or group of educational centers, teams include teachers who are teaching directly to students, both from General Education and Differentiated Education (or a specialty), as much as possible of the same educational level. It is crucial that the team also includes a pedagogical director who leads the faculty and enables the PBL implementation in each of the educational centers.

b. Analysis of the technical skills or generic learning objectives expressed in the graduation profiles and integration of the general and differentiated (or specialty) curriculum, through the identification of focal points that will support the achievement of the competencies expressed in egress profiles.

On the other hand, teacher teams who apply interdisciplinary work through a project must have clear common and individual goals to be achieved, such as:

- A learning difficulty degree adequate to the study programs and educational level.
- The learning coverage defined in the plans and study programs.
- A learning approach, ability or transverse goal in more than one instructional area, achieving greater impact.

c. The cooperative learning methodology set-up for the classroom work with students, as this is a key success factor for the subsequent PBL implementation. It is intended, at this stage, in order to guide the teacher job in the classroom, to implement a lesson plan explaining through different strategies and cooperative work techniques, that students work out most of the time as a team, in which they must play an active role and interact with others, taking on different roles. Although the classroom design or lesson plan simplifies the teaching work, it should be flexible in order to adapt to the reality of students and to the context of the center.

d. Setting up the PBL methodology, based on interdisciplinary work to determine the theme of the projects to be developed with the students, the preparation of teaching materials and assessment tools, in order to identify the earlier behaviors that the students must have to its resolution. This phase, regardless of the model with its different steps applied, requires a great ability of the teacher to flexibly adapt the model to the reality at the Center.

e. Functionality of the PBL teaching staff. Regarding the coordinating and planning timing, it is important to maintain a schedule that allows the work of the teachers for planning and follow-up. In this respect, it is necessary to be flexible by adapting to the demands of the project (setting schedules, spaces, furniture that respond more to functions than papers etc.).

3. PBL methodology implementation in class

The active methodologies in the classroom, in particular the development of projects, provide the possibility for students to comprehensively learn, supported by their teachers. In this sense, the relevant aspects to its implementation in the classroom were the following:

a. Using a template as a teaching resource. This allows students to take ownership of the project methodology and develop integrated technical skills, generic objectives and general training learning.

   The model that guides the PBL implementation in SNA Educa considers the following phases:

   The occasion, the moment when the teacher values the educational potential of a given theme, analyzing the goals that may arise, the acceptance it will get from the students and the impact on the educational community.

   The intention, the stage at which the group of students, along with the teacher, decide whether the project will take place.

   The look, the project design and its possible routes, from this moment the group starts to work on the project.

   The strategy, research that identifies different routes to be followed by the group members in the development of the project.

   The action, completion of a final product or service.

   The architecture (transverse phase to the previous five stages), continuous account of the project development in all its phases.

   The evaluation (transverse phase to the previous five stages), a process that combines the evaluation of the teacher with the self-assessment and the group co-evaluation.

Table 1 shows the intervention of the teacher and students in each phase of the model used.

Table 1 - Material planning based on the PBL project

PHASES	TEACHER ACTIONS	STUDENTS ACTIONS
THE OCCASION	SURPRISE ONESELF	
	A project is born Feature-Oriented Domain Analysis (F.O.D.A.)	
THE INTENTION	DECIDE	
	Look for detonator Summarize impressions	A project is born They express experiences in regards to the activities performed and commitments they made
THE LOOK	DRAWING THE PROJECT (ROUTES)	
	Activates previous knowledge, what do students know? Problem formulation	Previous knowledge? What do we know?
THE STRATEGY	RESEARCH AND DO	
	Research design, lines of work Research management Required resources	Proposals and research lines Research proposal formal writing Proposals defense
THE ACTION	ACT AND CHANGE	
	Summarize action proposals introduced Estimates the impact	Project product Action Proposal
THE ARCHTECTURE	TRANSVERSE TO THE ENTIRE PROCESS	
	Defines the architecture format	Proposes the project architecture: how to gather everything that happens during the project?
THE EVALUATION	TRANSVERSE TO THE ENTIRE PROCESS	
	Continuing evaluation of learning processes, project, and relational dynamics	Continuous and final evaluation (co-evaluation and self-evaluation)

Source: VERGARA (2015).

Class planning. Its purpose is for the teachers to introduce the PBL model, which will become the script, and will make it easy for the students to develop and put into practice their several skills around a project development.

Figure 3 - Lesson Planning

SUBJECT/STUDY FIELD/MODULE			
COURSE/GROUP			
TIMING Total hours assigned to the project: Weekly hours assigned to the project:			
EXPECTED LEARNING AND EVALUATION CRITERIA			
Expected Learning	Evaluation Criteria EL	Generic Learning Objectives EL	
	CL1		
	CL "n":		
EL Contents	Grades	Procedures	Professional Outlook

Source: Own depiction.

b. Project general planning. It describes the modules or materials involved, the objectives covered (general and specific) and all the details displaying a process synopsis and the interdisciplinary work to be carried out by the teachers in different centers.

Figure 4 - General planning of a project

1. PROJECT TITLE/ PROJECT SLOGAN

2. GENERAL OBJECTIVE

3. AREAS/SUBJECTS/INCLUDED COURSES

TEACHER	AREA	CONTENTS	COURSE

Subject/Area/Module	Included Course	How my area contributes to the project?

4. PROJECT SPECIFIC OBJECTIVES

AREA	SPECIFIC OBJECTIVES	COURSE

5. SKILLS TO DEVELOP DURING THE PROJECT

Cognitive skills (TO KNOW)
Affective and social skills: (TO FEEL + SHARE):
Metacognitive skills: (TO KNOW ONESELF)
Problem solving skills: (TO SOLVE)
Concepts and principles to apply: (TO DO/ACT):

6. COMPETENCES FOR LIFE /TRANSVERSE COMPETENCES/ GENERIC LEARNING OBJECTIVES

Learning as a process:
Cooperation:
Executives:
Critical thinking:
Creativity:

Source: Own depiction.

c. Implementation monitoring. Monitoring and follow-up of major milestones, through virtual or in-person meetings on the progress, follow-up visits to teams of teachers, additional reports on the progress, in order to assess compliance levels of different stages, which take into account the achievement of objectives in the implementation of the project.

d. Contextualizing of projects. The projects developed by students are related to the social or professional context situation, which is particular to the facility. This helps students to get more involved, and, as a result, they occupy the center stage and are able to test their knowledge, skills and behaviors, in addition to being more receptive to new learning and solutions. Examples of projects developed by SNA Educa:

Figure 5 - Examples of PBL Projects developed by SNA Educa

Source: Own depiction.

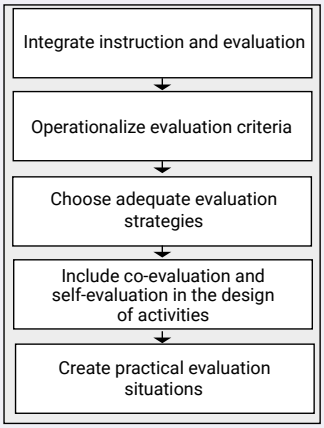
4. Evaluation in the project creation process

It is important to mention that the "assessment" stage is performed transversely throughout the project process, as it provides continuity, motivation and engagement in young people's learning.

The evaluation criteria specify the achievement level regarding learning outcomes and describe what is desired in all its dimensions (conceptual, procedural and attitudinal).

The synthesis of the evaluation process that teams of teachers from each center address is as follows:

Figure 6 - Stages of the evaluation process



Source: Own depiction.

A number of teacher and student evaluation cases are presented below:

Table 2 - Evaluation function during the learning process

The evaluation must assist with the observation of all participants about the learning. It must be an element that is present during the entire process and combine the educator evaluation with the self-evaluation and group co-evaluation.	
TEACHER	**STUDENT**
Continuous evaluation (tools, agents, timing). It functions as working guide to the weekly, biweekly, or other evaluation sessions	Continuous evaluation (it functions as basis the previous observation to the weekly, biweekly, etc. evaluation meeting)
Evaluation of the learning results (with demonstration of tools, agents, timing, if no headings are used)	Final evaluation (it functions as a guide to the final evaluation meeting)
Evaluation of project phases (of resources, timing, grouping, techniques and dynamics utilized)	
Evaluation of the relational dynamic (operation of teams, the teacher role, community agents, etc.)	

Source: Own depiction.

A variety of supporting tools, timings and participants involved in the evaluation coexist in the PBL:

- A few of the supporting tools are portfolios, learning journals, questionnaires, conceptual maps, cooperative team evaluation target, the Six Thinking Hats, data flow diagrams, role drama play, open questions, multiple choice questions, product evaluation headings, etc.
- As for the timing, the evaluation is performed with different frequency: daily, weekly, biweekly, monthly and up until the end of the project.
- Grouping levels are considered in regards to the subjects to be evaluated, that is, the student is individually evaluated, as well as the work group and the course group.

Finally, teachers evaluate their own teaching process to support or modify their pedagogical interventions, in order to reach the proposed learning objectives in the project planning.

The relevance of the work done would not make sense if we did not consider the impact it caused in students and teachers.

Next, a few opinions collected through interviews with students and teachers during the follow-up visits:

> The cooperative work helped me to get to know myself (third-year High School student, with specialty in Automotive Mechanics, *Liceo Agrícola el Carmen de San Fernando*).
>
> The teacher guides us and we find our own answers (third-year High School student, with specialty in Industrial Mechanics, *Liceo Industrial Guillermo Richard Cuevas de San Felipe*).

> We all learn and realize that we are able to contribute to the work group (third-year High School student, specialty in Industrial Mechanics, *Liceo Industrial Guillermo Richard Cuevas de San Felipe*).
>
> To take on a role within the work group help us to better organize ourselves, to save time and it compels everyone to work (4th-year High School Student, with specialty in Agriculture, *Liceo Agrícola de San Felipe*).
>
> It takes longer to organize everything, however, better results and products are achieved, besides, students learn more (Science Teacher, *Liceo Agrícola de San Felipe*).
>
> The cooperative work helped to integrate students who were apart from the course (English Teacher, *Liceo Agrícola el Carmen de San Fernando*).
>
> It is amazing to see the findings and issues that arise from students being challenged by the teacher, learning by themselves, achieving significant progress (Specialty Teacher, *Liceo Industrial Guillermo Richard Cuevas de San Felipe*).

5. Final considerations

The Project-Based Learning is a conducive methodology to the 21st century education, because students take on a leadership role in the teaching-learning process.

In addition, it turns out to be a relevant methodology for technical training, since it enables the acquisition of technical and labor skills by young people, with the use of a balanced combination between theory and practice.

The Project-Based Learning is a conducive methodology to the 21st century

In the context in which the PBL methodology is developed the acquisition and practice of social skills by the students are promoted while strengthening their integral education, raising the relevance and response to the demands of social and productive environment. On the other hand, it contributes significantly in the coordination of different subjects that make up the curriculum, both for the general education and the differentiated education; such integration is a basic tenet in order to obtain a quality technical education.

From the experience in the implementation of the ABP methodology, with regard to the installation and management aspects:

- The methodology requires a paradigm modification in the way some teachers think, that is why the socialization with them about the PBL benefits and its leadership role in the implementation is paramount, as well as the dissemination of its impact and results. The success of its implementation demands the willingness of teachers and administrators, as it requires to be updated in its practices and knowledge, is willing to investigate and have enough flexibility to work with other teachers.

- Curriculum analysis makes it possible to identify learning goals more compatible with the PBL methodology.
- It is essential to set up the cooperative learning methodology in advance.
- The implementation of the PBL methodology should be gradual, systematic and flexible, it is supplemental to other learning methodologies, and it is not for all contents or for all times.

In regards to the Management.

- It requires more time for preparation and implementation. Teachers who take on a new role as facilitators need more time to plan and evaluate the processes, which translates into teachers committed and cohesive as a PBL team. The majority of teaching teams required an adjustment period to decide on the theme and the project progress. The performance was smoother with the teams holding the same educational level courses.
- One of the main challenges is to keep a log of all phases. This evidence alone will make it possible to evaluate the project progress and the learning process level expected.
- The functionality of the project will depend on a detailed and accurate planning, as well as the leadership and management team support of each center.
- The follow-up is fundamental to the teams that are developing a project for the first time. There is a risk of focusing on the final product or service, leaving all planned learning objectives behind. One should always focus on the learning pursuit.

In regards to the benefits obtained with the methodology implementation:

- Students find meaning in learning, because, thanks to the PBL, they learn working in contexts that are meaningful to them, and it becomes a lifelong learning experience.
- It increases training times, avoiding content and learning repetition among the subjects.
- Critical thinking, autonomy and motivation development are maximized to the students.
- It causes teachers to seize education egress profiles.
- It strengthens the skills of students and teachers by means of interdisciplinary and cooperative work.

To ensure the methodology progresses in centers, three actions are suggested to improve it, to measure its impact and perfect it:

- To formalize and systematize its implementation in the study program.
- To strengthen, on a permanent basis, the competences of teachers.
- To build a bank or repository of projects.

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PROJECTS-BASED TRAINING AND LEARNING EVALUATION[1]

"It is necessary to develop the question's pedagogy.
We are always listening to the answer's pedagogy.
Teachers answer questions students have not asked".
(FREIRE, 2017)

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Abstract

The core of this article is the evaluation as an integral part of project-basic training, and for this, it takes back basic concepts and those that theoretically support it. The reflection begins by defining what the training for projects is for the National Training Service of Colombia (Sena) in their different phases, to approach from there the steps defined for the evaluation process of training and the learner integration, finally outlining the challenges that in practice represent, for the instructor, its implementation.

Keywords: Project-basic training. Pedagogical strategies. Sena. Project method. Learning evaluation.

1. Introduction

The National Training Service (Sena)'s mission is established in Law 119 of 1994, in the following terms:

> [...] to fulfill the State's role of investing in the social and technical development of Colombian workers, offering and executing comprehensive professional training, for people's incorporation and development in productive activities that contribute to the country's social, economic and technological development (COLOMBIA, 1994, article 2).

In order to achieve this social responsibility, Sena should guide training programs for the development of the learners and workers' skills, similar situation to the competent personnel's certification meeting the productive sector's current and future needs; process necessarily mediated by the evaluation of learning as an essential

and inherent part of the training. An evaluation that should make it a priority to promote learning in its design and practice (MORENO OLIVOS, 2016).

Since the 1990s, Sena has been working on the strategy of project-based training in labor skills development scope. With the methodological strategy of project-basic training, the institution intends to transcend the merely formalist vision of the educational process and the administrative pressure by measuring the results, which in some cases do not know the possibilities of the learner's creativity (MORENO OLIVOS, 2016). It is proposed that learners acquire skills in a simulated productive environment, called "The training project", a meeting point between training and work, while at the same time seeking to promote an evaluation system for obtaining skills, which responds to the very dynamics of the knowledge construction within the process (AMORÓS, 2011).

2. Project-basic training

For Sena, project-basic training is:

> [...] a nuclear or agglutinative methodological strategy of a new training model, seeking to give a correct answer to the new demands that emerge of the socioeconomic changes caused by the globalization (SENA, 2007, p. 24).

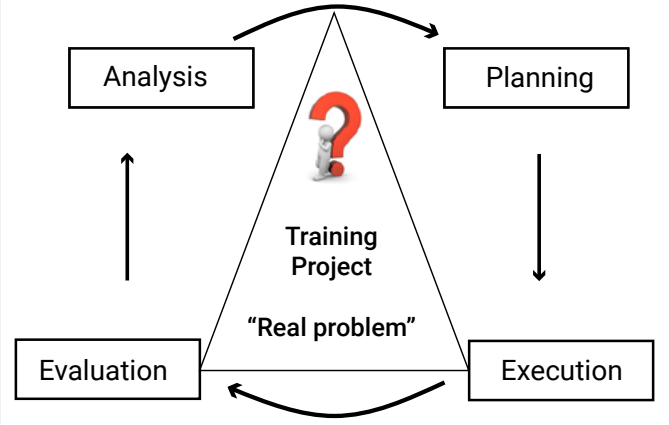
Thus, learning is part of the productive context of recognizing that competences are only measurable in action, from a perspective that is not only technical but also ethical and social (ZAPATA PÉREZ, 2017). This means that the learner not only develops the knowledge, skills, abilities and talents, but the combination of all these elements in a specific context, assuming from the ethical the responsibilities of acting.

The training project, as an excuse for learning, integrates the competences of a didactic structure, consistently with the productive process and the training in action, and breaks the dichotomy between theoretical and practical, when confronting the learner with a "real problem" allowing him/her to develop the capacity to understand, process, select, organize and transform knowledge, apply it to different situations and contexts due to the values and intentions of the personal or social projects themselves (MORENO OLIVOS, 2016).

The project-based training methodology allows then the creation of a mental structure for the problem solution, the own knowledge construction and the new demands recognition for the updating of the labor competencies from the productive processes.

To the project-based training as pedagogical strategy, Sena responds to the planning of the steps highlighted in Figure 1.

Figura 1 - Steps in project-based training



Source: Own depiction.

The learner is located in a specific context to solve the problem, methodologically crossing the following steps:

- Analysis: At this stage the instructor presents the training project proposal designed by the team executing the training; the learner studies the problem, validates or adjusts the proposal and, with the instructor's monitoring, collects pertinent information that can bring it to solution, reviews possible alternatives, and selects the most viable.
- Planning: The learner, assisted by the instructor, carries out the planning of the activities to be developed and defines the work schedule, identifying the dates and resources for its management.
- Execution: The learner develops the planned activities with the guidance of the instructors' executing team.
- Evaluation and control: At this stage, learners and instructors carry out the reflection of the whole process, related to the revision of the objectives, the results achieved and the aspects to be improved in the future.

Through this course, it is intended to create in the learners enough skills to learn, but also to unlearn in a flexible way, according to the context changes and the complex situations' demands, which are not only to be understood, but also involve the mobilization of all their knowledge to be able to solve them in the best possible way, within the defined parameters and limitations imposed by the context of the training project (ZAPATA PÉREZ, 2017).

One of the project-based training benefits is the methodology for evaluating learning, hence the importance of reviewing the steps that must be taken to properly develop the process, while the model requires the integration of the learner and the permanent monitoring of the instructor to achieve within the training period, in coherence with the teaching-learning model, evaluate the learner's ability to analyze and seek solutions

in the procedure and not only the result of the recognized exercise in the training project. In the words of Fernández López (2017), not focusing the evaluation on the final score, but validating the method and guiding the learner during the process.

This situation allows a wide margin so that, from the educational practice, the instructor facilitates knowledge construction, encompassing the perspective of learning to know, learning to do, learning to live, learning to be (DELORS, 1996); in this sense, the evaluation of learning is a very important factor for the project-based training strategy, as it develops tools and techniques for monitoring, verifying and achieving skills.

3. Training evaluation

The evaluation process should be considered a central issue in the professional educator profile (MORENO OLIVOS, 2016). Evaluation is not the final moment of a process, and even if it were, it should be the beginning of a new, richer and more informed process (SANTOS GUERRA, 2002).

Traditionally, learning evaluation seeks to "measure" what is learned according to the "quantity" of knowledge, privileging anyhow the memory aspects. Here, evaluation has a privileged weight for most students, many of whom continue to learn for the evaluation (MORENO OLIVOS, 2016). From this perspective, evaluation constitutes an instrument of power, qualifying or disqualifying with a judgment of absolute value (Approved/Reproved), a view that with different nuances is maintained in the Colombian educational system, while certification remains one of the requirements to access the working field in many cases.

As the center of the training, the learner is the manager of his/her own learning process

Unlike this situation, in the strategy of project-based training, the evaluation is the result of observation, analysis, and evaluation of the evidence collected during the training project process transcending the memorial act, describing the degree of skills ownership, which will allow the learner to develop himself/herself in the labor and social context for the future. He/she is prepared to make decisions that can serve as support for lifelong learning (MORENO OLIVOS, 2016).

As the center of the training, the learner is the manager of his/her own learning process. The instructor acquires the mediator or facilitator character, and must assume the huge responsibility of evaluating the evidence based on the evaluation criteria established in the curriculum, which is structured according to the competencies defined by the productive sector.

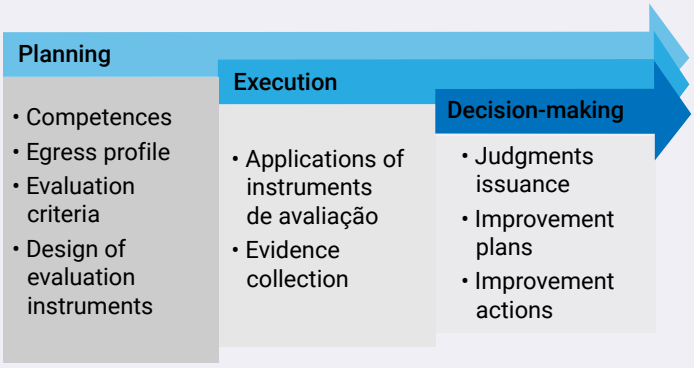
3.1 Evaluation steps

In order for the instructor to fulfill the huge commitment to evaluate, it was institutionally established a cycle or set of steps that must be performed to verify the evidence allowing the comprehensively assess whether the learner has achieved defined levels of knowledge, skills, attitudes, and values.

When developing these different steps, the instructor makes the evaluation a continuous and parallel pedagogical act in the confrontation of standards and in the achievement of valuable work skills throughout the training process. This is where the learner can demonstrate the capabilities and abilities to understand and apply the skills, as well as the project's own result.

Figure 2 shows schematically the evaluation steps, separated by a purely explanatory purpose, since they are performed simultaneously with the activities carried out by the learners with the instructor's guidance during the whole training, from a pedagogical feedback to the teaching/learning process, to decision-making with the learner and continuous improvement.

Figura 2 - Evaluation steps



Source: Own depiction.

3.1.1 Planning

The evaluation planning assumes a preponderant value and involves the revision and analysis of the elements of the curricular design and the instruments creation by the instructor. As an example, for a technology course in Graphic Development of architectural and engineering projects, the elements to be considered are the following:

- The technical and transversal competences for the case of the technologist in graphic development are: Measure, Develop digital presentation techniques, Express information about construction projects, Acquire, Organize resources, Promote appropriate interaction, Understand and produce texts in English.
- The egress profile: Defines the desired characteristics, starting from a holistic vision that facilitates the future graduated to compete in the labor market with a high professional level. In addition, with entrepreneurial conditions to create his/her own projects. In the case of the technologist, the egress profile becomes qualified human talent for developing construction projects with support to architects, engineers, and industrial designers, adding regulatory components

and technological advances, free citizens, with critical capacity, solidarity and entrepreneurs.

- Evaluation criteria: Are those indicating the achievement level that the learners must achieve during the training process, defined from the curricular design, for the learner to manage them, knowing in advance the clear and objective rules established by the techniques, criteria, moments and expected results of different knowledge comprising the competence: knowing, doing, being. These criteria are the reference for the instructor to objectively evaluate the advances in the competences acquisition besides being found in the design, for example. For the "Developing Digital Presentation Techniques in Construction Projects" technical competence, the criteria are:
    - Apply basic photography concepts for imaging. Identify and manage peripheral equipment and tools, use modeling, animation, rendering, image and video editing programs.
    - Apply color, brightness, lighting and textures to virtual 3D models to create scenes simulating real conditions.
    - Define timeline and sequence parameters in animation by using audio tracks in virtual presentations.
    - Use computer tools to display images and videos and configure print parameters according to advertising and sales criteria.
- Designing evaluation tools: It is the construction of tools allowing systematically collect the evidence and experiences of the learner during training, from the integration of knowledge, skills, abilities, attitudes and values in the productive context associated with the project, in such a way that the instructor can infer, under a reasonable and objective judgment and in training times, the coherence of the exit profile, the curriculum design and the learner achievements. In this sense, any instrument and actor are valid, once they provide information not only on quantity but also on progress quality. For the Technologist in Graphic Development, they are evidenced by a checklist in the assigned project final delivery, in a virtual model.

3.1.2 Execution step

Developing the evaluation requires the instruments implementation, depending not only of the advanced learning activity at the moment, but also of the knowledge the instructor has on his/her learners and it is where it can, from a proactive perspective, enrich the process. This is the margin on which the project method allows to develop a pedagogical dialogue and to build knowledge. To achieve this, it is important:

- Self-diagnosis: The learner begins his/her process with an amount of previous knowledge, experiences, interests, prejudices or beliefs of his/her cultural environment. However, it can incorporate new knowledge and this information is the starting point for the instructor to evaluate and adjust their interaction as

an agent, that activates them, from an open dialogue, and plan how to integrate it into the state of the art or discipline's technique or technology and the criteria established from the competences guiding the curricular design.

- The instructor's recognition of learning styles; this is how the learner appropriates meaningful knowledge as a single individual and is responsible for managing the "learning to learn" process, enhancing his/her professional and personal development.
- The organization of assertive work teams favoring social interaction during learning and constructive criticism, for skills development and the experience of ethical principles and social values with an ethical aspect, demanding the collaborative skills development for the most appropriate solution to the problems that arise.
- The integration of information technologies as one of the sources knowledge, which evolve and change so quickly, shows that accumulation is not important, since they are available, but rather the development of skills for its transfer to other contexts (MORENO OLIVOS, 2016).

Evaluation is part of the ongoing dialogue between the learner and the instructor, who, through properly planned instruments, collects objective evidence of the expected achievements, respecting individualities and learning rhythms, to give feedback to the process.

Thus understood, the evaluation allows:

- To the learner, in a timely manner, recognize error as another knowledge source, evaluating not only what he/she learns, but also how it is learned, his/her strengths and weaknesses to address new situations in the future.

Evaluation is part of the ongoing dialogue between the learner and the instructor

- To the instructor, enough autonomy to soften in each specific case his/her actions according to the learning styles and the context of the knowledge construction.

3.1.3 Decision-making

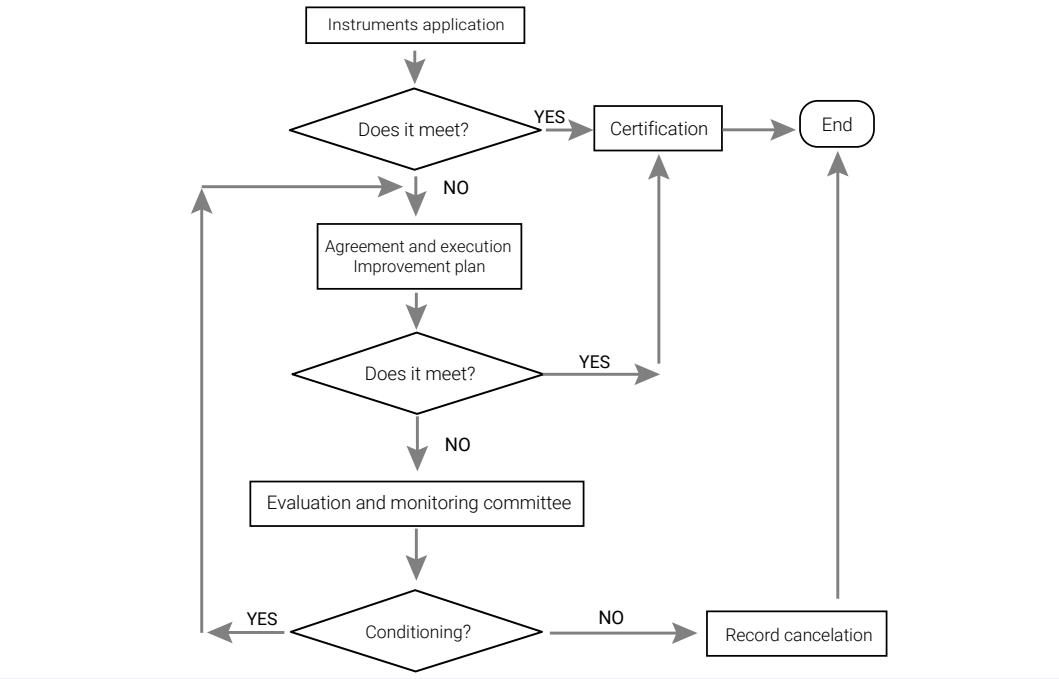
Decision-making, as indicated in Figure 2, involves the judgments issuance, improvement plans with each learner and improvement actions for the training process of other groups, allowing feedback to implement creative actions within the learning outcomes found, stimulating then strengths and neutralize the difficulties that arise.

When the learner does not achieve the expected results, the situation must be analyzed once it constitutes a failure and, as such, is described in the following terms:

> Failures are those actions or omissions that alter the normal training development, the coexistence in the educational community, the academic performance of the Learner or his/her classmates, and which, when they arise, give rise to the need for a punishment and/or educational measure (SENA, 2012, Article 23).

It is important to point out that, due to Sena's nature and, in line with vocational skills training, failures are classified as academic and disciplinary, once not only the technical component is enough, but also the attitudinal component is necessary to guarantee the training integrality and the learner competence; this is why, after applying the instructor's teaching strategies, the learner has the right to develop improvement plans according to the procedure described in Figure 3.

Figura 3 - Evaluation steps



Source: Own depiction.

An improvement plan for training:

> It is a measure adopted to define training actions, after exhausting instructor's educational strategies and learner's initiatives... assigns agreed actions between the Learner and the Instructor or the Academic Coordinator, formulated during the training program performance to ensure the achievement of learning outcomes (SENA, 2012, Article 27).

If the combined actions are not satisfied and, aiming at respecting due process, the learner regulation establishes the procedure for the imposing educational measures and/or punishment, whose most severe level is the cancellation of the academic record and whose meaning cannot be understood in a different way, because the learner failed to demonstrate the acquisition of skills and therefore cannot be certified; i.e., he/she does not present the output profile, the learning outcomes in the context proposed by the project and the achievements of the learner in the appointed time for the training.

4. Learner's Integration

As pointed out by Sena's regulation, the learner is the manager of his/her own learning process and is in permanent communication with the instructor, making the evaluation a moment for the procedures review and adequacy, which, from a pedagogical point of view, benefits the integrating elements of learning in real time, from motivation and goal setting to the analysis of achievements and difficulties (FERNÁNDEZ LÓPEZ, 2017).

Around these strategies and integrating learner, instructor and group, the simultaneous use of hetero-evaluation, self-evatuation, and peer evaluation are validated as tools to collect evidence:

- Through hetero-evaluation, the instructor continuously collects evidence of the training process, such as learning styles, responsibilities, autonomy, group integration, mistakes, successes and achievements to establish the learner's corrective and progressive transference of the responsibility of managing his/her learning process.
- Co-evaluation or peer evaluation for training purposes throughout the process, which is accomplished through the advances' presentation and socialization, allowing feedback to the group in two ways, reinforcing in the learners the acceptance of the other, in an environment of tolerance and constructive criticism (MORENO OLIVOS, 2016).
- With self-evaluation, learner can, in a unique, critical and conscious way, review his/her successes and failures based on knowledge and recognition of concepts, principles and performance validation of his/her learning and that will be the support in a world where skills change with the use of technology and specific performance conditions.

Learning is an active, permanent, continuous and individual process demonstrating the methodology, the learner's progress, the learning environment and the different participants, in which hetero-evaluation, self-evaluation and co-evaluation are activities composing the didactic structure for preparing the learner as the central axis of his/her own learning process (FERNÁNDEZ LÓPEZ, 2017).

5. Final considerations

The backbone of the teaching/learning processes at Sena's training is the learner, and that is why it is committed to the promotion of an evaluation system for skills realization under the strategy of project-based training, in which the very training dynamics allows the knowledge construction.

Evaluation, as an integral part of the teaching/learning process in project-based training at Sena, is an essential activity of the instructors' pedagogical action, who value in the process all the elements inherent in learning, integrating technical

knowledge with learner behavior, to fulfill a transforming function, which allows him/her to play its active role in the knowledge construction and in the skills acquisition.

It should be a process that leads to an ongoing reflection on what has been said, the review of the instructor's profile, his/her pedagogical skills, the understanding of the training model, the project-based training strategy and its capacity and creativity to reach the training objective: being the mediator who favors learning about teaching, for learners to have the initiative and autonomy to develop their lifelong skills, under the premise of learning to learn, learning to do, and learning to be, as integral subjects conquering self-realization and contribute to the social, economic and technological development claimed by the country, which is precisely the Sena's mission as an entity of integral vocational education and free of state character.

Note

[1] This article has the accompaniment of the National School of Instructors "Rodolfo Martinez Tono", from the Directorate of Training of the National Training Service (Sena) of Colombia.

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PAST, PRESENT AND FUTURE OF PROJECTS-BASED TRAINING IN COLOMBIA[1]

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Abstract

A journey through the history of projects-based training at the National Training Service (Sena), a vocational education institution in Colombia, associated with non-formal, technical, technological and, recently, higher education. The article presents theoretical references, and the comprehensive professional training is analyzed, including its ontological and epistemological aspects. The projects-based training is essentially characterized by a curricular, interdisciplinary, application and resource management approach. Finally, the article formulates the future of the projects-based training.

Key words: Training. Education. Projects. Work.

1. Introduction

The National Training Service (Sena) is the flagship vocational education institution in Colombia. It was founded in 1957 following the Brazilian National Service of Industrial Training (Senai) and accelerated training schemes from France, among other countries (MARTÍNEZ; NOGUERA; CASTRO, 2003).

Throughout its history, the Sena has been part of the Ministry of Labor, although its educational function has been classified in different terms: non-formal education, technical and technological education, job and human development training, and higher education. As part of the Sena's missional nature, emphasis is usually placed on the social and technical development of workers, comprehensive professional training, productivity, competitiveness, inclusion and technological development:

> The SENA is in charge of fulfilling the State's role of investing in the social and technical development of Colombian workers, offering and implementing comprehensive professional training for the incorporation and development of

> people in productive activities that contribute to the social, economic and technological development of the country (SENA, 2018).

The Sena's trajectory is so extensive that it is possible to refer to projects-based training taking a look at its history, and even proposing challenges which will confront the institution in the near future. In the beginning, training programs tailored to the needs of a particular company were called "projects", for which it must be considered that initially a large part of the Sena's training processes were developed in the company. Today, the institution has an important infrastructure, more than 117 Training Centers, so that a large part of the training activity is developed in its own headquarters. Nowadays, the projects-based training in the institution is essentially characterized by a curricular, interdisciplinary, application and resource management approach. In the short run, the Sena faces challenges to implement the projects-based methodology with a pedagogical approach, incorporating research activities proper to its institutional nature.

Training programs tailored to the needs of a particular company were called "projects"

In 2014, the Sena constituted the *Escuela Nacional de Instructores* "Rodolfo Martínez Tono" which depends on the Direction of Vocational Education and manages most of the training orientations and actions, training and development of Sena instructors at the national level, for which it has developed training activities in specific and cross sectional areas of pedagogy, as well as research on pedagogical issues and/or related to the comprehensive professional training developed by the institution. Due to its nature and closeness to instructor training, debates are emerging in the *Escuela* about the relevance of the pedagogical discourse in the vocational education and among them, the impact on the projects-based training for the learners' training.

The following section presents theoretical and contextual references for the projects-based training in general and, particularly, in the Sena. It then discusses the nature of comprehensive professional training, in other countries it is called tertiary education or Vocational Education and Training (VET), including an analysis of ontological and epistemological aspects. After that, there is a journey through the history and present time of training mediated by projects in the institution. Finally, the challenges which can be faced are exposed for the near future of the projects-based training.

2. Theoretical references

On the international contemporary scenario, Amorós (2017, p. 10) points out that good projects-based learning practices share three key elements:

> They place the student in the central axis of their own learning, develop learning models based on *Blended learning* projects and dynamics, and create projects arising from the needs of the environment, thinking of a global impact.

The concept of project is at risk of being polysemic. It can be conceptualized very broadly: "First scheme or plan of any work which is sometimes done as a test before giving it the final shape" (DRAE), leading to almost any activity or work prototype. In addition, the term is often referred to in different scenarios, not only in the education field, for example: life project, bill, productive project, etc.

In the Colombian context, it is common to refer to the logical framework of projects as a tool used to articulate institutional resources and/or to solve problems. Postgraduate studies in project management are increasingly common, as well as the requirements of this kind of studies in public institutions for new employees.

In any case, in the educational field there are traditions, which allow reference to projects-based training methodologies from the beginning of the 20th century in North America (Dewey) and the middle of the same century in London (Bernstein). It can be pointed out more accurately that:

> The projects-based methodology owes its initial development to a set of actions in different parts of the world, especially in Russia, Germany and the United States. Its origin is attributed to researchers of different countries, [...] German historians consider Professors Charles R. Richards and John Dewey based on the *Manual and Industrial Arts Programs* work in 1900, while Americans attribute it to the expert on agriculture Rufus W. Stimson based on his *Home Project Plan* work in 1908, but they consider the educator William H. Kilpatrick as the great promoter based on Stimson (CIRO ARISTIZIBAL, 2012, p. 14, author's faucet).

Currently, there may be coincidences in relation to the goals identified for projects-based learning:

- Training people capable of interpreting the phenomena and events happening around them.
- Developing motivation towards the search for and production of knowledge since through attractive learning experiences involving students in complex, real life projects, skills and knowledge are developed and implemented (CHILE, 2015).

In the Colombian context, there are authors who agree on pointing out, among the benefits of projects-based learning, the integration of subjects supported by documented research activities, such as the research developed by the National University of Colombia (JURADO et al, 2011).

Other benefits of projects-based learning have to do with:

- Organizing activities regarding a common goal defined by the students' interests and commitment.
- Promoting creativity, individual responsibility, collaborative work, critical capacity, decision-making, efficiency and the ability to express personal opinions.
- Students experiencing the ways of interacting that today's world demands.

- Combining positively the learning of important contents with the development of skills that increase the autonomy in learning.
- The development of the person; the students acquire the experience and spirit of working in groups as they are in contact with the project.
- Developing social skills related to the group work and the negotiation, planning, performance, monitoring and evaluation of one's own intellectual capacities, including the problem solving and value judgments.
- Addressing a social need, which strengthens the student's value and commitments with the environment (CHILE, 2015).

The researcher Michael Knoll argues that this subject, in historical terms, has been approved superficially, and considers that this methodology was not the product of the progressive industrial movement in education emerging in the United States at the end of 19th century, but that its first use dates back to the 16th century (CIRO ARISTIZIBAL, 2012, p. 14). For this analysis, five historical periods are proposed to recapitulate the history of projects-based training:

> 1. 1590-1765: Beginning of the projects-based work in the European architecture schools [in the Academy of Saint Luke, in Rome, Academy of Fine Arts];
>
> 2. 1765-1880: The project as a common learning tool and its migration to America;
>
> 3. 1880-1915: Projects-based works in manual teaching and public schools;
>
> 4. 1915-1965: Redefinition of the project method and its migration back to Europe;
>
> 5. 1965-nowadays: Rediscovery of the projects-based philosophy and the third wave of international expansion (CIRO ARISTIZIBAL, 2012, p. 15).

According to Ciro, it is also worth pointing out that projects-based learning emerges from a constructivist approach, which made progress from the work of psychologists and educators such as Lev Vygotsky, Jerome Bruner, Jean Piaget and John Dewey:

> It must be taken into account that the constructivist movement, which seeks to provide students with tools that give them the generation and modification of ideas to elaborate their own knowledge, was what focused the attention of the educational methodologies towards the learning as an active process of the individual. That constructivist thought had great contributions in the educational advances, which allowed to leave the traditional method as sovereign methodology, and, in its developments, had an application towards what was called the projects-based learning, and it is supposed that it was developed precisely by William Heard Kilpatrick.

> At the beginning of the 20th century, within the so-called American progressive movement, Kilpatrick proposed the project method as the first pedagogical model based on the empirical experience supported by John Dewey's theories, proposed at the end of the 19th century. This proposal is based on the scientific experimentation, adopting spontaneous interests in the student to enhance their activity within the autonomy and solidarity framework. The educational practice of pedagogical pragmatism materialized in the project method, inspired by Dewey and formulated by is disciple Kilpatrick in 1918. Its application began at the Columbia University in the City of New York in 1918 but had little popularity in the United States. After that, it was forgotten and only rediscovered in the 1970s when the idea of the project method was again proposed but linked to an overt curriculum concept and community education (CIRO ARISTIZIBAL, 2012, p. 16).

Currently, there are definitions of projects as research strategies, which allow didactic flexibility, addressing the environment's needs:

> A project is an in-depth investigation of a task/problem; its development generates a large number of actions demanding a responsible use of autonomous working time. In training projects, the problems are integrating elements of knowledge, making the training offer more personalized and flexible, because, as Garrik said, the pedagogical flexibility can be understood as breadth of learning, which creates opportunities to carry it out. Thus, pedagogical flexibility, performed through projects, becomes an ideal scenario that creates different learning contexts favoring new forms of interaction and making it possible a great variety of competences (AMORÓS, 2017, p. 12).

3. The nature of the comprehensive professional training

For some thought leaders, the concept of training is broader than the concept of education

Sometimes it is important to make a difference between the formal and non-formal education; differences can be found in the literature in terms of school and non-school education; in social sciences it is possible to make a difference between socialization (common in sociology), "enculturation" (recurrent in anthropology) and learning (frequent in psychology). For some thought leaders, the concept of training is broader than the concept of education (it can be thought of the Kantian concept of adult training), while others believe that the concept of education is broader and involves different scenarios (not just formal schooling).

In the case of Colombia, the concepts of training and instruction in the second half of the 20th century are often associated with educational processes in the employment context. Although the term training is used in the 1991 National Political Constitution, at the beginning of the 20th century, the governmental entity in charge of formal educational processes was called Ministry of Instruction – today it is called Ministry of National Education (MEN).

In Latin America, there are agreements in which the job training processes have had a parallel history, sometimes distant, to that of the traditional academic education processes. However, at present, in different parts of the world, the differences between job and formal education training are diffuse (VELDE, 1999).

With the references, it is interesting to review the institutional ontology (the Sena's nature) in order to allocate the epistemological foundations of the comprehensive professional training (the nature of the knowledge managed). Although the Sena has been part of the Ministry of Labor, initially the categorization of its training process was non-formal education, then technical and technological education, and nowadays job and human development training (technical level programs), and higher education (technological level programs).

In the last decade, the demands of qualified registration by the MEN to meet the requirements of the technological level programs have generated questions within the institution, for some people it is a risk that may blur the Sena's vocational nature by an academic court, as is expected to be found in the stereotype of the average university:

> While some officials within the entity state that the Sena is not prepared to be labeled as a university and its emphasis on 'work' should not be changed by an emphasis on 'academic', others agree that, at the end, an educational function which allows it to be part of the formal and higher education is developed (MARTÍNEZ RAMÍREZ, 2015, p. 56).

In the technical and technological context, according to Mario Bunge, the scientific research seeks to understand cause-effect relationships, while in technological knowledge, the most important thing is to analyze and develop effects and then go to the causes. This idea can help to reflect on the nature of knowledge according to its directionality and functionality.

The Sena is constituted following the scheme of the Brazilian Senai and practices inspired in the schemes of accelerated training of some European countries. There are several discourses around the creation of Sena; for its understanding, it is important to identify the international and local historical context.

In the second half of the 20th century, there were important changes in the consolidation of the economic and geopolitical order at the international level:

> When finished the Second World War in 1945, the humanity had to readapt to another situation. The military industry slowed its production pace and the manufacturing company reconsidered its goals and launched the search for new markets. Small countries-backward, as they were called- began an era of adjustment to suit different circumstances. The universal conflagration left a terrifying aftermath of destruction and disaster, but in order to develop the most formidable military machinery known until then it discovered technologies and systems which changed the economic game worldwide (QUIROZ DE ARENA, 1978, p. 7).

Thus, in the education of the second half of the 20th century, important changes were introduced and marked the notion of the education and its function. Education is now seen as a consumer's good and not just as a luxury for a few elites. Education for empowerment is viewed in most developed countries, and technological transfer is expected for poor countries (SCHUMACHER, 1983).

About the purposes of the Sena beginnings, there are several stories that converge. On the one hand, there is the version that highlights the struggle of the Colombian workers to demand social benefits and training from the government (the Sena and the family compensation funds are born at the same time in Colombia); in this version of the history the following aspects are important: the efforts of the workers to claim better conditions, the church to support the notion of family welfare, the employers to agree to facilitate or collaborate in the process. There is another version of the birth of Sena, which highlights the work of its founder Rodolfo Martínez Tono, for having the vision and led the first big efforts for the entity creation and expansion in line with the need to qualify the workers from the country. There is even a version about the creation of Sena that highlights the international context:

> The SENA was among the first projects through which the United Nations Development Programme (UNDP) began its activities in Colombia. In 1959, the expanded program of technical assistance, after providing advice and funding to two projects from 1950 to 1954, approved two projects in December 1959: one of them for Sena vocational training and the other for soil survey of the Northern part of the Eastern plains (MARTÍNEZ; NOGUERA; CASTRO, 2003, p. 47).

In other American and European countries, reference is often made to the type of education developed by the Sena as VET or tertiary education. In the case of Colombia, the lack of articulation of the educational system has made it difficult for various sectors of the Sena's academic community to accept the concept of tertiary education for the function of the Sena.

The epistemological foundations of the comprehensive professional training are not alien to the ontological, political and economic institution characteristics. The differences between an academic-scientific approach and a labor-technological approach can determine the horizon that the knowledge and the characteristics of the projects developed in the institution may have.

4. The history of projects-based training: past and present

In the first decades of the Sena, reference was made to project structuring to identify the training programs developed to fulfill the training needs of a company or a particular organization, which constituted one of the first forms of projects-based training, not only by name but also by attention to an actual need in the working environment. In the 1980s, this idea became more formally sophisticated through the Agreement 12 of 1985 (Sena, 1985), which defines the project as a management

tool that foresees and organizes planning, technical-pedagogical and administrative actions in order to fulfill a societal need within the framework of the entity's goals and policies. The instrument defines the structuring of the response to fulfill the population needs according to Article 13 in the Technical Unit of the Sena (1985). Thus, technical-pedagogical and resource management aspects are mixed in the project design in such a way that they are intermingled with a systems perspective, and administrative and pedagogical aspects.

> The SENA's Projects-Based Training model implies an expansion of the pedagogical action radius of this methodology, going beyond the traditional application scenarios to create new learning environments, both in our own facilities and in companies and places where students live or work, prioritizing the economic and social needs and demands of the environment. This projects-based model has led to the development of a management guideline for the Centers, which integrates organizational and technical-pedagogical variables (related to the center management, material, pedagogical, and didactic aspects, etc.) (AMORÓS, 2017, p. 14).

It is worth highlighting the administrative emphasis given to the project designs in the Sena. For example, the Agreement 12, Article 15 of 1985 states that a project is constituted in units of: "Programming, Administration, Execution, Budget and Costs, Evaluation"; the Article 16 of this Agreement states that "the Comprehensive Professional Training contemplates, in its phases, administrative processes which ensure the efficient and timely provision and organization of human, physical and financial resources". Thus, although so-called technical-educational aspects are incorporated, the emphasis is still placed on the administrative issues.

Some examples of the projects-based training spirit at the beginning of the Sena, in the sense of developing practical application in real working environments, also applying concepts of integrity and interdisciplinary, including the community work, are the following initiatives:

- The *Programa de Promoción Profesional Popular Rural (PPPR)*, especially in the early 1970s.
- The *Programa de Promoción Profesional Popular Urbana (PPPU)*, since the late 1960s but had its peak in 1970.
- The *Programas Móviles*, especially after 1974.
- The *Capacitación Empresarial Campesina (CEC)*, also since the 1970s.
- The *Laboratorios Experimentales de Organización Socioempresarial (LEOS)*, documented since 1976.
- The *Capacitación para la Participación Campesina (Capaca)*, also since the 1970s.
- The *Capacitación para la Integración y Participación Comunitaria Urbana (Cipacu)*, since the mid-1980s.
- The *Sena Comunitario*, also since the mid-1980s.
- *Jóvenes Rurales*, since 2003.

Projects receive a new meaning, involving the new generation of knowledge

The emphasis on these projects-based training strategies was mainly on achieving an important coverage, especially for populations located in outlying areas or with certain types of vulnerability, so that strategic objectives were combined with pedagogical tools. In the particular case of the LEOS, the emphasis on the use of pedagogical tools with activities of experimentation and simulation was clearer.

In this way, it is possible to identify how the Sena has developed efforts to fulfill the historical and territorial needs of comprehensive professional training, for example, in its first decades; it adapted itself to the national requirements to reach the rural areas, the outlying areas and the most isolated areas from the big capital cities.

In the first decade of the 21st century, with the influence of European trends and the United Nations Educational, Scientific and Cultural Organization (Unesco), speeches that point out the importance of lifelong learning, the interdisciplinary, the importance of innovation in the application of active didactics, the training relevance in accordance with changes in working and technological environments, etc. are propagated. Besides that, a new meaning is given to the training projects in the Sena, seeking to place more emphasis on the pedagogical aspects of the projects-based learning methodology. Thus, projects receive a new meaning, involving the new generation of knowledge instead of giving priority only to business aspects, although it is possible to consider working environments as a pedagogical reference to simulate scenarios of the working world in the teaching-learning-evaluation process.

Precisely at the beginning of the 21st century, a difference is made in the Sena among "productive" projects, which emphasize aspects of entrepreneurship and enterprise, "training" projects, which are focused on the generation of knowledge, and "productive-training" projects, which integrate the two previous horizons.

According to Amorós (2017, p. 14-15), the Sena has adopted the projects-based training as a main strategy for the development of competencies "seeing it from a methodologically integrative perspective that understands the projects as the basis of the training activities proposed to learners in a training program and that also incorporates other didactic techniques as a complement".

In 2007, the institution established a conceptual and pedagogical framework for the implementation of projects-based training in the Sena, in which the following key aspects are pointed out: job skills (generic and transversal); learning principles, such as the tacit dimension of knowledge, problem-based learning, construction of meaning, meaningful learning, metacognition and self-regulation; also some didactic principles, such as: not substitution, anticipation or optimal lag, motivation, individuality, sociality, thematic interdisciplinary, methodological diversity, psychic interfunctionality, predictive homogeneity, dynamic theoretical-practical reciprocity, critical-constructive explanation, and creativity (Sena, 2007, p. 37-50).

In the first decade of the 21st century, the emphasis is placed on projects-based training as an opportunity to simulate real working environments; in this way, different types of infrastructure projects are promoted to simulate actual productive environments in the institution's training environments.

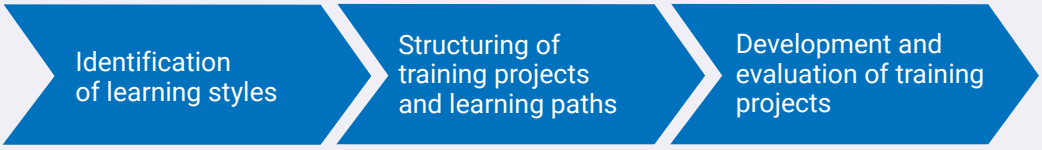
Nowadays, projects-based training is expected to allow the development of theoretical-practical activities, curricular integration, personalization of training processes (learning path is a name given to a set of projects that integrate a training program, such projects may vary according to the needs and characteristics of each learner), integration of the skills approach, development of productive projects and acquisition (and generation) of knowledge.

To exemplify the way in which projects-based training is currently applied in the Sena, in a synthetic manner, it follows two types of practices: those suggested in the available institutional literature (discursive practices) and the way in which specific actions are commonly assimilated and implemented in the training environments (non-discursive practices).

Among the discursive practices, it can be related that the methodology must allow personalization processes, respecting the learning rates and styles, for which it is possible to diversify the training projects in a group of learners according to individual differences; in this way, within a group, different learning paths could be developed (so that each path would contain a different set of projects), making it easy the personalization of the teaching-learning-evaluation process.

The procedures also state that projects can be defined by learners at the beginning of the training process. In the daily application, the policies of coverage extension and the income profile of the learners make it difficult the actual application of these procedures. In the following figure, the exposed scheme is summarized.

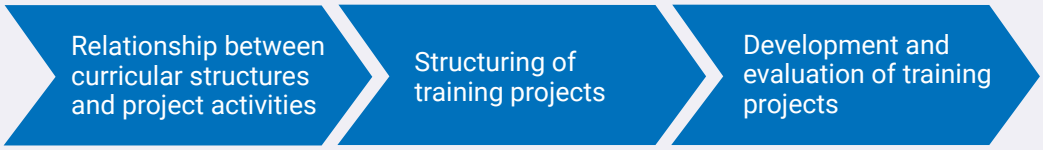
Figure 1 - Discursive practices in the application of projects-based training in Sena



Source: Own depiction.

In the non-discursive practices, emphasis is often placed on a curricular perspective, so that curricular structures (curriculum) are usually related to project activities oriented to field application or designed to integrate different contents. In the following figure, this scheme is summarized.

Figure 2 - Non-discursive practices in the application of projects-based training in Sena



Source: Own depiction.

An interesting advantage in discursive practices has to do with the personalization potential of the teaching-learning-evaluation processes; a disadvantage would be associated with the limitation of experience by privileging a particular learning style or in the limited application of project diversification (since it poses administrative limitations for its operation).

Some identifiable advantages in non-discourse practices have to do with the potential of training projects to develop applications in actual working environments and to solve technological or business problems; a disadvantage would have to do with the limitation of experience when too general learning activities (to make it easy the curricular integration) or too specific learning activities (limited to a single context or a single process) are proposed.

The following table summarizes the advantages and disadvantages of discursive and non-discursive practices associated with the projects-based training in the Sena in the last decade.

Table 1 - Advantages and disadvantages of discursive and non-discursive practices associated with the projects-based training in Sena

	Discursive Practices	Non-Discursive Practices
Advantages	Personalization of teaching-learning-evaluation processes. Integration of activities for entrepreneurship and enterprise and for the generation of knowledge and research.	Applications in actual working environments and for the solution of technological problems or in business contexts.
Disadvantages	Limitation of experience by privileging a particular learning style.	Limitation of experience when too general or too specific learning activities are proposed.

Source: Own depiction.

Some recent success stories in the application of projects-based training in the Sena include the development of research approaches (VARGAS PARGA, 2016), the simulation of business environments (BONILLA CELY, 2016; RINCÓN TRUJILLO, 2016), actions to reduce unemployment (HENAO PUERTA; BOLAÑOS BETANCOURT, 2016), the inclusion of Afro-Colombian populations (AGRONO

MORALES et al., 2016) and populations with cognitive disabilities (FLÓREZ LOZANO, 2016; MALAGÓN; ACUÑA; MARTÍNEZ, 2018), innovation and decentralization of resources (ALDANA VALDÉS, 2016), and the application of mathematics in context (BORJA MONTÑA, 2016), among other cases that have been documented recently, thanks in large part to the editorial support and effort of the *Escuela Nacional de Instructores* "Rodolfo Martínez Tono".

5. The challenges of projects-based training: the future

It is important to generate space of reflection to understand the current scenario and the horizons for improvement. Following Amorós (2017, p. 11), it is possible to state that projects-based learning broadens students' knowledge and develops their skills to make them more competent, but in order to achieve that there is a need for a deep didactic reflection which helps to define "what" we want to teach, "why" we are going to teach it and, above all, "how" we are going to teach it.

It is important to generate space of reflection to understand the current scenario and the horizons for improvement

A recent paradoxical situation in the educational field in general is to place emphasis on improving the coverage policies, which have obtained interesting outcomes in this field, taking risks of ignoring the quality of education. Although policies to increase coverage have had significant results, priority should be given to strategies that do not increase the number of students per classroom. Besides that, it is easier to personalize the educational processes using projects-based learning when a group of learners ranges from 7 and 14 participants, even a number close to 25 or 30 is reasonable (project diversification would be administratively feasible), as opposed to having more than 40 learners per classroom (workshop, lab or training environment).

6. Final considerations

The Sena has successful experiences in the application of projects-based training, such as: the development of productive projects starting from the use of the resources of the Training Centers; the integration of resources of different Training Centers for the development of projects that have been called inter-centers; the project integration for the generation of knowledge and, at the same time, for the development of entrepreneurship and enterprise activities.

An important conclusion is that the incorporation of projects-based learning methods can be assumed as a challenge for the near future, placing more emphasis on the pedagogical aspects with a vision centered on the subject learner and the subject instructor, overcoming the tradition of emphasizing curricular and administrative aspects (without ignoring their importance).

Another interesting challenge is to incorporate with greater precision the development of research projects in the job skill training, leading to the creation of research areas

that tend towards the integration of relevant research activities for and with the productive and technological sectors that impact the institution, recognizing its missional nature, and leading to the research in pedagogy and education in general.

A journey through the history of projects-based training allows us to visualize the very history of the pedagogical movements in the institution, and their institutional and epistemological nature. In order to make an adequate prospective of projects-based training in the Sena, it is important to recognize its history with the purpose of applying innovative developments which respect the own characteristics of the comprehensive professional training.

In recent years, the *Escuela Nacional de Instructores* has generated important debates regarding the pedagogical approach of training projects. In general terms, has sought to improve the enrichment of pedagogical experiences. In operational terms, has discussed the feasibility of diversifying training projects so that a training program can have a wide range of training projects which can optimize meaningful learning and generation of knowledge, without blurring the nature of job training which has historically characterized the institution.

In theoretical terms, it is necessary to generate debates and reflections about the potential of training projects to guarantee the enrichment of the pedagogical experience and evaluate their actual impact, the involvement of research activities, as well as a perspective which contextualizes the strategy with a broader approach that involves the problem-based learning, going beyond the traditionally applied perspective focused on administrative, pragmatic and entrepreneurial aspects, without losing the institutional nature on the horizon.

Nota

[1] This article had the accompaniment of the *Escuela Nacional de Instructores* "Rodolfo Martínez Tono" of the Training Direction of the Colombian National Training Service (Sena).

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LEARNING BASED ON PROFESSIONAL TRAINING CHALLENGES IN THE BASQUE COUNTRY

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Abstract

After a brief contextualization of the Basque Country, this article describes the ETHAZI (High Performance Cycles in Basque) training model that is being developed by Tknika - Research and Innovation Centre Applied to Vocational Training - in order to respond to the new demands that arise in the workplace as a result of globalization and the exponential increase in technology.

Keywords: Vocational training. Educational innovation. Teaching training. Specific and transversal competences. Basque Country.

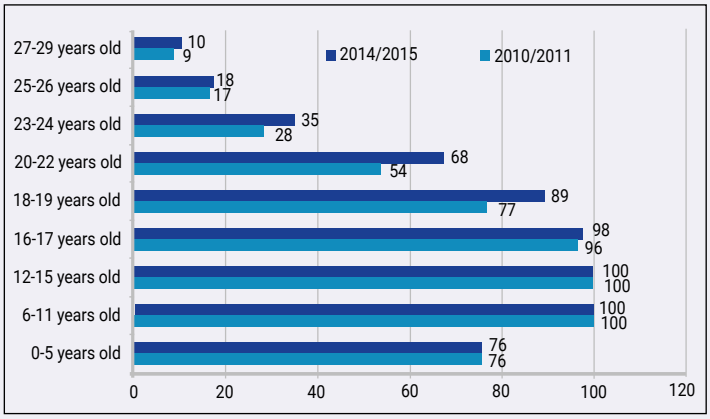
1. Introduction

The Basque Country is an Autonomous Community located in the North of Spain bordering the Southwest of the French state[1]. This Autonomous Community is directed by the Basque Government, which, in the context of the State of Autonomies, has its own competences (not all of them developed in their totality) as opposed to those of the State in different spheres, and, in particular, in both education and employment.

In relation to the subject matter of this article, some data and characteristics of the current Basque Country are as follows:

- Demographically, in a similar way to what happens in the most developed countries of Europe, it is a population that is progressively ageing, with a low birth rate that does not reach the replacement rate.
- The schooling rates are high (Figure 1) at the same time as the school dropout rate (Table 1) is not high.
- The educational level of the population has increased over the years, which translates into a better educated active population (Figure 2) with the passage of time, and in which people with low or no qualifications decrease significantly.

Figure 1 - Schooling rate by age



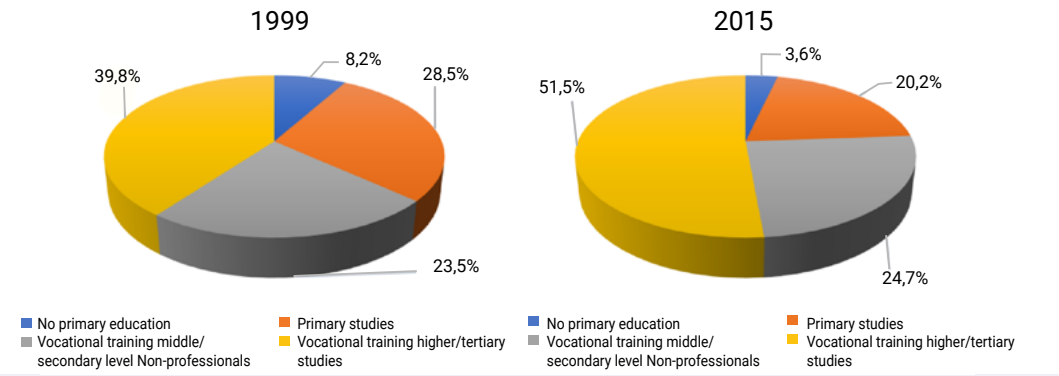
Source: Consejo Económico y Social Vasco (2018, p. 35).

Table 1 - Early school dropping rate

	2014		
	Amount	Women	Men
EU, 28	11,1	9,5	12,7
Sweden	6,7	6,0	7,3
A.C. of Euskadi	7,2	6,6	7,7
Denmark	7,7	6,0	9,3
France	8,5	7,4	9,5
Netherlands	8,6	6,8	10,3
Finland	9,5	7,2	11,9
Germany	9,5	8,9	10,0
United Kingdom	11,8	10,7	12,8
Spain	21,9	18,1	25,6

Source: Consejo Económico y Social Vasco (2018, p. 34).

Figure 2 - Active population by educational level



Source: Own depiction (ADEGI, 2016, p. 2).

- The unemployment rate (Table 2) has doubled in the last decade, and although in previous years it was above 16.5%, by 2016 it was above 12% and is expected to be around 10% by the end of this year. In general, young people have been the most affected by unemployment and, within them, initially women, although at the beginning of this decade the trends began to change.

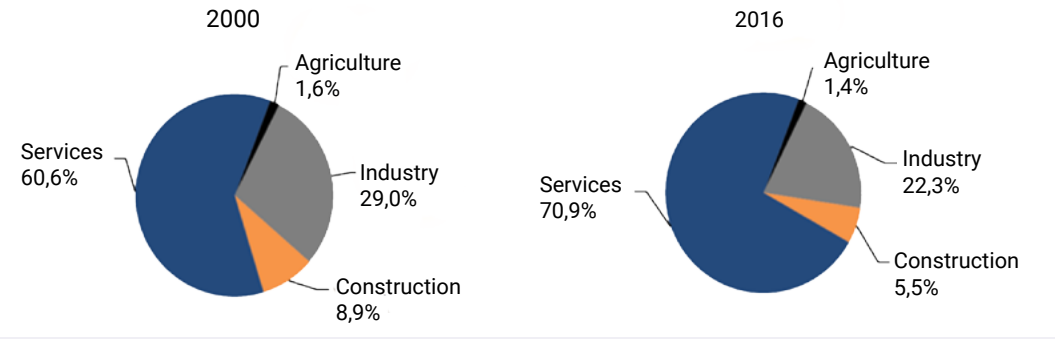
Table 2 - Unemployment rates (total and young people by sex) in the CAPV

	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total population	6,6	11,3	10,7	12,4	15,6	16,6	16,3	14,8	12,6
Young (16-34 years-old)	10,0	16,9	17,4	19,0	23,7	25,6	24,9	22,8	21,2
Men	9,5	17,7	17,1	18,6	24,9	26,6	25,7	23,9	20,6
Women	10,5	15,9	17,6	19,5	22,3	24,4	24,1	21,7	21,8

Fuente: Consejo Economico y Social Vasco (2018, p. 53).

- From the point of view of labor activity, services are consolidating as the main source of employment (Figure 3), and although industry recedes in the 21st century, its weight continues to be greater in the CAPV than in the 28 countries of the European Union (EU28) as a whole, since the participation of industry in Gross Domestic Product (GDP) is 4.4 percentage points higher than in the EU28 (CONSEJO ECONOMICO Y SOCIAL VASCO, 2018, p. 83-84).

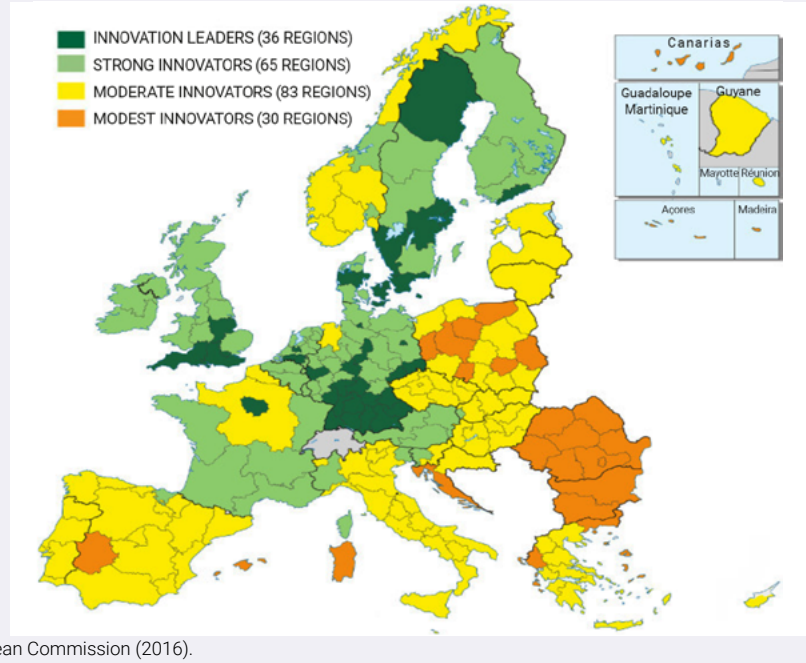
Figure 3 - Evolution of the working population by activity sectors (CAPV)



Source: Consejo Económico y Social Vasco (2018, p. 83) 34).

- Support for companies - particularly small and medium-sized enterprises (SMEs) - for the improvement of the productive fabric and competitiveness is based on support for Research, Development & Innovation (R&D&I), which allows the Basque Country to position itself in a good position in the European innovative sphere (Figure 4).

Figure 4 - European Innovation Index by Regions



Source: European Commission (2016).

The current labor context, although defined and/or characterized by the so-called Fourth Industrial Revolution, is part of a broader and more complex dynamic that presents a new society based on information, big data, robotics and artificial intelligence, which leads us to glimpse that

> The 21st century is not a continuation of the 20th century, but a new and conceptually very different one. In this era, everything is connected with everything. This requires new strategies and ways of thinking to face the great problems and challenges of humanity (MENÉNDEZ VELÁZQUEZ, 2017, p. 268).

2. Tknika: Research and Innovation Centre Applied to Vocational Training in the Basque Country

Tknika is the Centre for Applied Research and Innovation in Vocational Training (VET) in the Basque Country, and was created by **Decree 39/2005**. Since then, and promoted by the Vice-Ministry of Vocational Training of the Department of Education of the Basque Government, its main vectors of action have been research and innovation applied to the world of VET.

The institution therefore becomes a dynamising element which, through vigilance and competitive intelligence, makes it possible to transfer innovative products and services of high added value to the vocational training centers of CAPV and, from there, to the business sector. To this end, it is currently organized into six major areas: Innovation applied in the field of VET; Continuous Improvement; Research on Learning Methods and Processes; Entrepreneurship and Change Management; Internationalization in the field of VET; Sustainability (last area incorporated).

Tknika develops its work in a network, with the involvement of the VET Centers and teachers of the Basque Country, taking the Autonomous Community itself as an initial scope of work, and opening up and collaborating with centers, organizations and institutions from all over the world, which has earned the title of **UNEVOC Centre** in the academic year 2016-17.

In this context, in the 2009-2010[3] academic year , and within the Area of **Research on Learning Methods and Processes**, work is beginning to take a new look at what is happening in the Vocational Training classrooms, taking into consideration what was happening at a social level, but mainly at a business level. In this sense, some keys that underlie this reflection are the following:

1. Companies are changing their ways of doing things, they are entering a new productive-labor paradigm, and they are going to require people with new skills and abilities, so it is necessary to make changes in the training proposals offered by the Centers.
2. The teacher can no longer work alone, it is increasingly necessary for teachers to work in teams. Educational change and improvement in the quality of education

will only occur if the group of teachers in a Cycle[4] - and for many aspects, those of the Centre as a whole - work as a team.

3. Vocational Training has to develop the specific technical skills of the corresponding work environment, but, together with them, "soft" skills such as responsibility, teamwork and problem solving are increasingly demanded.
4. The integrated development of the competencies demanded requires overcoming the division between theory and practice, tackling real situations and problems from inter and transdisciplinary approaches.
5. It is necessary to move from models focused on teaching to models that emphasize learning; therefore, it is also necessary to change both the role of the student - more active and responsible for his own learning and that of the teacher - more oriented towards dynamizing and favoring learning rather than transmitting content.
6. In this context, students' learning, in addition to being active - in which they play a leading role - must also be collaborative/cooperative learning aimed at solving problems and situations similar to those found in the work environment for which they are preparing.
7. Today's world, and particularly the world in which life is going to develop, is going to be a digital world; therefore, it must be competent to function as a digital citizen applying ethical principles and values in relation to all of this.
8. In this context of progressive automation, aspects such as creativity and entrepreneurship will be those that make it possible to maintain the competitiveness of people and companies, thereby improving the quality of life of society.
9. All of the above requires new forms of organization of the Centers, of the hourly distributions, of the assignment of tasks, of the spaces.
10. At the same time that the different aspects mentioned are changing and/or refocusing, it is essential to rethink the evaluation as well, advancing towards a new approach of a more formative and evolutionary nature in which the student has a new protagonism.

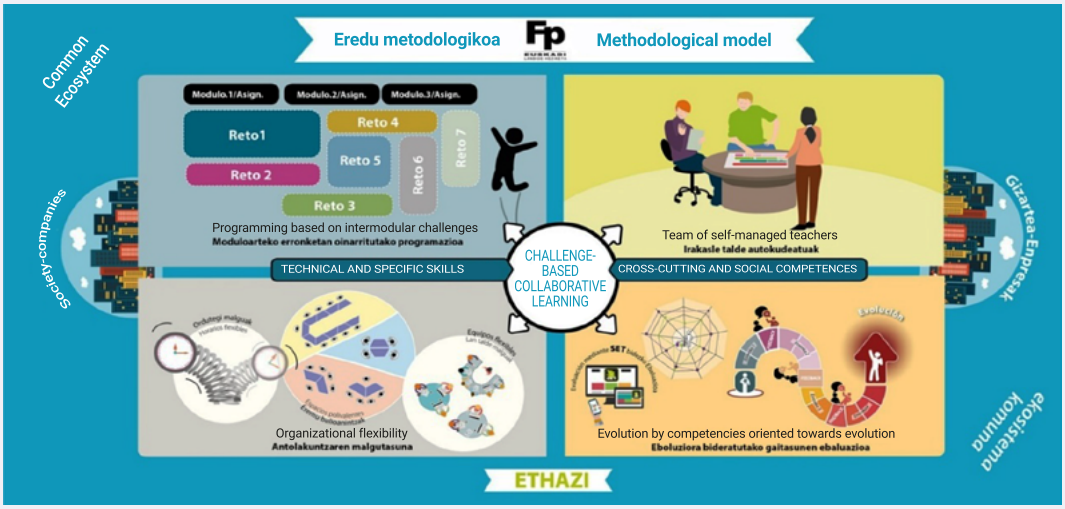
It is necessary to move from models focused on teaching to models that emphasize learning

2.1 Approach to the ETHAZI model (High Performance Cycles)

As stated in Astigarraga, Agirre and Carrera (2017), the analysis of the scope of educational practices and existing trends led Tknika to define the ETHAZI model for vocational training in the Basque Country. This model, still in evolution, development and growth, is represented graphically (Figure 5) based on the following elements:

a) Context or ecosystem

Figura 5 - Graphical representation of the ETHAZI model



Source: Tknika

The educational activity and, in particular, vocational training is inserted in a social and working context that has its particularities (history, characteristics, evolution, relationships) and needs to which these training proposals must respond. The context or ecosystem - in which both companies and society as a whole are located - has been characterized in recent years by globalization, digitalization and hypertechnologization.

Briefly, some of the main characteristics that the world of work is presenting are:

- Changes in the skills required in jobs from: new jobs and professions, which will demand new skills; modification of the skills required in practically all occupations due to the influence of technology; disappearance of professions, which will render obsolete the skills associated with them.
- Polarization in jobs, which shows a decrease in low-medium complexity levels, which seems to indicate greater difficulties for automation in jobs at both ends, and in particular in those occupations that require medium-high and high skills (AUTHOR; DORN, 2013; CEDEFOP, 2018; ELLIOT, 2017; LOSKHAREVA et al., 2018).
- Greater demand for qualifications, which translates into a broader level of competence for people, integrating both technical or professional skills with the transversal or 21st century skills (ASTIGARRAGA; AGIRRE Y CARRERA, 2017; INTER-AMERICAN DEVELOPMENT BANK, 2016; EUROPEAN COMMISSION, 2015; LOSHKAREVA et al., 2018; WORLD ECONOMIC FORUM, 2015, 2016).
- Importance, not easily automatable, of social-emotional skills (ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, 2015) and, to a lesser extent, of cognitive skills -mainly those of a high level- as opposed to those of a psychomotor nature, which will entail working with -and controlling of- robots and new intelligent machines in areas such as: cybereconomics, creative economy,

people-oriented services, care for the environment, new emerging technologies... (LOSHKAREVA et al., 2018).

b) Challenge-Based Collaborative Learning (ACBR)

At present, there are multiple approaches and proposals for educational change based on different strategies and/or methodologies, the ones with the greatest potential being those "based especially on research and collaborative work (given that) these approaches explicitly prepare students for future learning" (ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, 2013, p. 88). As an example, and without wishing to be exhaustive, it can be mentioned: Project Based Learning; Project Oriented Problem Based Learning; Inquiry Based Learning; Research Based Learning; Phenomenon Based Learning; Event Based Learning; Work Based Learning; Challenge Based Learning and others.

Within these methodological strategies, one can, in turn, find different methodological proposals (Project Method, Analysis Method, Simulations, Case Studies, Workshops, Design Thinking...)[5] that are not exclusive, being able to use many of them in a combined way.

From Tknika, being aware that under the denomination of Challenge Based Learning there are different proposals[6], a wide, flexible, even eclectic view is proposed, along the lines pointed out by Barron and Darling-Hammond (2010, p. 231), when they recognize their importance and validity because "they enable communication, cooperation, creativity and deep thinking". However, they also underline the difficulty of applying them, since:

> depend to a large extent on the knowledge and skills of the teachers who apply them... Teachers need time and a community that supports their ability to organize project work in a sustained way. Strong pedagogical skills are needed to manage long-term projects in classrooms, keeping in mind that the goal is 'do by understanding', not 'do by doing' (BARRON; DARLING-HAMMOND, 2010, p. 231).

In this sense, the ACBR - always open to further and particular concretions, has the following main characteristics:

- **Collaborative Learning**

As reflected in Astigarraga, Agirre y Carrera (2017, p. 74), Collaborative Learning entails (BARKLEY; CROSS; MAJOR, 2012; INSTITUTO TECNOLÓGICO Y DE ESTUDIOS SUPERIORES DE MONTERREY, 1999) are based on:

- Work in small teams (usually heterogeneous).
- Positive interdependence between the members of each team, and sometimes - depending on the proposal being developed between the different teams.
- Individual and group responsibility, and reflection throughout the development of the work proposal.
- Simultaneous interaction between team members, but also with teachers.

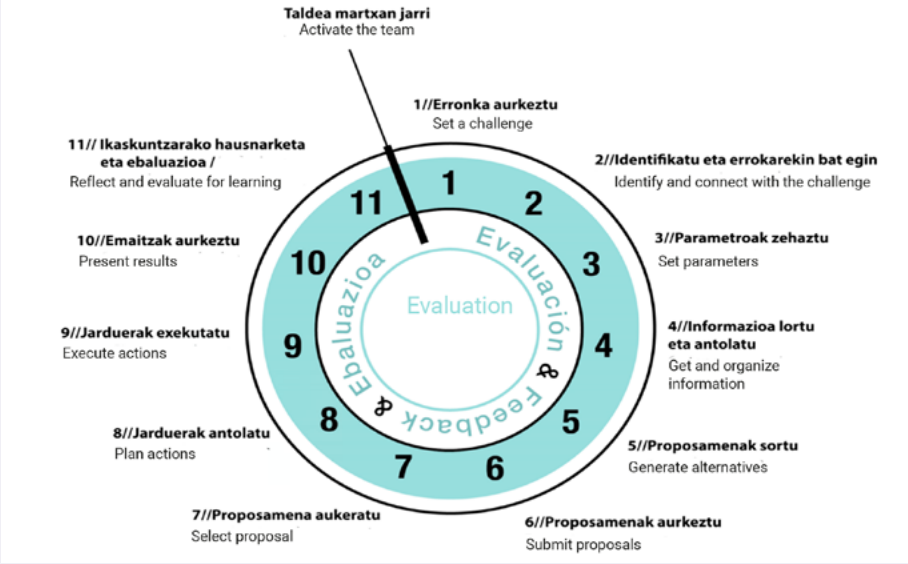
- Putting into practice social skills in interactions at the team level, as well as in relations with teachers and people from abroad (companies, institutions, etc.).

Challenge-Based Learning

The Challenge is a problem situation that, in general, has the following characteristics [7]:

- It is a situation - as real as possible - of the working context for which it is being trained.
- It therefore requires an analysis of the environment with what is presented as close to the people who have to face it.
- It is sought that it has more than one solution, in order to make possible spaces/ situations of divergent and creative thought.
- It therefore involves analysis and reflection on the situation (context, background, parameters and conditions and identification of alternatives).
- In this sense, the proposal that is made can be diffuse, blurred, so that its concretion remains in the hands of the work teams.
- As it has been pointed out, it involves the collaboration and teamwork of the students.
- It is based on and requires the activation of previously worked and developed contents and knowledge.
- However, it is not a mere application of previous contents and knowledge, but it entails the work on new contents and the development of new knowledge.
- It is therefore based on action, directed by the search, analysis and processing of new information, oriented to the achievement of previously defined Learning Outcomes (technical and cross-cutting).

Figure 6 - Phases in the development of a challenge



Source: Tknika

- As a result of these processes, it generates evidence and products (reports, prototypes, plans, infographics, videos, presentations, concept maps, and timelines) that make it possible to follow the evolution, as well as the evaluation of the development of the Learning Results (technical and cross-cutting) previously defined.
- Generally speaking, although each challenge may have its own particularities, Figure 6 shows the main steps or stages that the identification, appropriation, development and evaluation of a challenge entails.

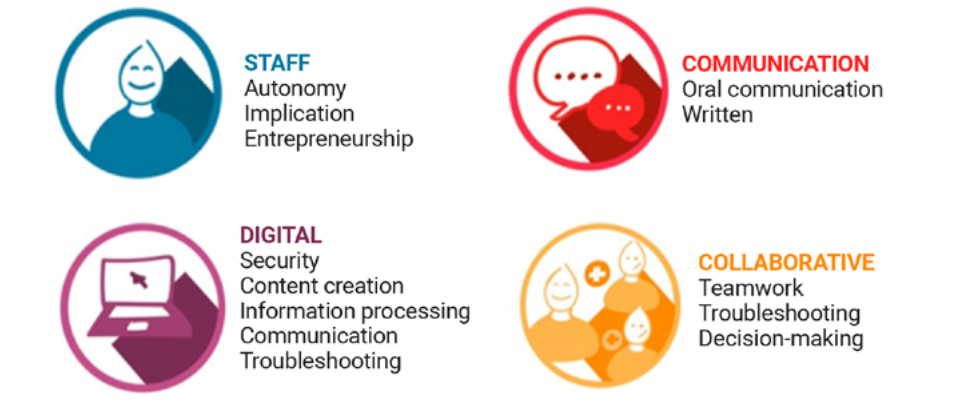
Oriented to the development of technical and cross-cutting competences

- Following the establishment of the European Qualifications Framework (EUROPEAN UNION, 2009), the definition of curricula based on Learning Outcomes was extended in European Vocational Training (CEDEFOP, 2009, 2010, 2016, 2017). In the Spanish context, the Learning Results (LR) related to Technical Competencies are clearly defined in the corresponding Royal Decrees issued by the Ministry of Education; perhaps less clearly, also in these Royal Decrees there is reference to the LR related to Transverse Competencies. All of this can be consulted on the website of the **Basque Institute of Knowledge - Ezagutzaren Euskal Institutua**.

It is possible to observe that, at the present time, LR related to cross-cutting competences are taking on a new prominence. This is mainly due to a double consideration; on the one hand, to the increased availability of content, easily accessible from virtually anywhere, at any time and at a very low cost; on the other hand, and related to the above, to the perception that this type of skills have a longer life span, and, at the same time, are less easy to automate.

In the context of the development of the ETHAZI model, Tknika proposes to the Centers four groups of cross-cutting competences (Figure 7) for their development in the different challenges.

Figure 7 - Cross-cutting competences selected for development in VET in CAPV

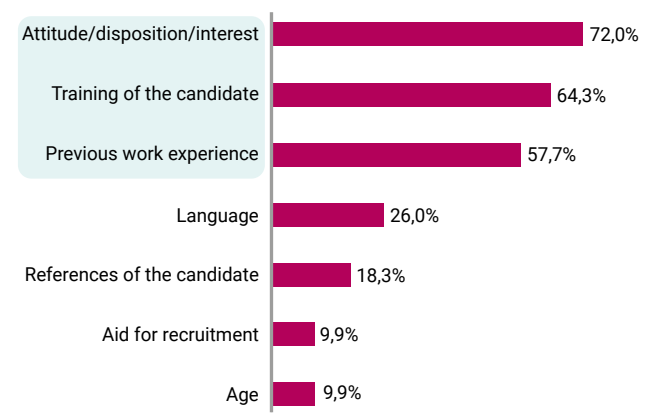


Source: Tknika

In the productive sphere, the importance of these cross-cutting competences is also evident in the immediate context, in which, as can be seen, are often related to attitudes, involvement and ways of acting in relation to the work context. Proof of this are the results obtained by **Confebask** in a survey answered by nearly 1,000 companies in the Basque Country this year, in which the main aspect taken into consideration by Basque companies when hiring is found under the heading: *Attitude / Disposition / Interest, followed by Training of the candidate* (Figure 8).

Within this cross-cutting scope, there are several characteristics that are highlighted, being among them: responsibility, proactive attitude, adaptability, autonomy and others (Figure 9).

Figure 8 - Priority aspects for contracting in Basque companies



Source: Confebask (2018, p. 27).

Figure 9 - Most valued cross-cutting competences for contracting in Basque companies

Source: Confebask (2018, p. 28).

In this way, the VET model that is being promoted in the Basque Country - based on Collaborative Learning, which is based on Challenges for the development of Technical and Cross-Cutting Competences - is structured around four axes:

1. Challenge-Based Programming

As it has been pointed out, the aim is for the programming as a whole to be designed and structured on the basis of the development of different Challenges. Given that the activities and situations that students will encounter in the workplace will be interdisciplinary in nature - as well as diverse in nature - the identification and design of intermodular (inter/transdisciplinary) challenges is promoted, which are developed and resolved through the combined use of different methodologies, which require individual and group work.

2. Programming developed by Cycle Teaching Teams (CTT)

The current educational perspective increasingly emphasizes the importance of teamwork among teachers, overcoming individualism and the exercise of the teaching function in isolation. Therefore, it is necessary - in this change of educational paradigm - to give autonomy and responsibility to teaching teams,

so that they design in a shared and consensual way the different challenges, organize their spaces and times, distribute tasks and responsibilities within the teaching team, and thus become a reference for the teamwork that will be demanded of students. As it is evident, the CTT are the nuclear and essential element for the development of this model, from its leadership, empowerment and training.

3. Organizational flexibility

The above aspects, in turn, demand new forms of organization within the Centers[8]. The teamwork of the teachers and the work based on intermodular challenges require time for planning, for the continuous work of the students in different activities, so that the spaces must also be rethought and accommodated to the new forms of work. Together with this, the self-management of the CTT means that the team of teachers themselves can adapt - depending on the needs that arise - the timetables of the students, that they can organize work spaces in a flexible way, etc.

4. Competence-based assessment geared towards the evolution of people and the development of their learning

The changes that are being proposed will hardly be consolidated if special attention is not paid to evaluation, adapting its approach and practice to the new approach that is being developed in VET classrooms. A broad view, in line with current educational approaches, places evaluation as one more tool at the service of learning; we are therefore talking about evaluation as well as evolution for/in the development of the competences - technical and transversal - of people. In this sense, the follow-up of the student, the tutoring of the same and the contribution of the corresponding feedback - both individual and group - are key aspects for the progress and progressive improvement in the training of students. All this is favored by a specific computer platform - Skills Evolution Tool (SET), designed specifically for these purposes.

2.2 Development of the ETHAZI model in VET centers

The development of the ETHAZI model in the VET Centers of the Basque Country has been taking shape on the basis of a structure or organization which, in business management, is called an "oil stain". Initially, Tknika's team of coordinators began by forming a small group of teachers, most of whom - while already working with active methodologies in their classrooms - were later acquiring monitoring and training functions for teachers, both from the Centre itself and from other centers that were incorporating the model in their Training Cycles.

Since work began on this model with five vocational training centers, the attachment to it has been voluntary both for the teachers and for the centers themselves. In order to extend the knowledge and application of the ETHAZI model, training has

been offered annually to all teachers of VET in the Basque Country, with a first level, basic, oriented to aspects of teamwork, communication and project-based learning; and another second level, the most extended, which focuses on the development of: Fundamentals of Collaborative Learning, Challenge-Based Collaborative Learning, and Competency Assessment. Although, as it has been pointed out, participation has been voluntary, enrolment in the training courses had to be approved by the Management of the Centre from which the teacher came; this is so with a dual purpose, on the one hand, for organizational and/or administrative purposes of the Centre itself, and, on the other hand, in order to progressively involve the Management of the Centers in the support and application of the ETHAZI model.

At the same time, training at a different level has been offered - normally to people who had completed the training proposal previously mentioned in a previous course - in order to generate what is known as Learning Coordinators. This is a figure, also supported and endorsed by the Management of the Centre (it is often an integral part of this Management), which aims to act as a leader of the methodological change in the Centre, for which this training will equip it with leadership and people management skills, competence in learning methods and techniques, and competences in the management of medium to long term projects.

These training courses, at both levels, in addition to the aforementioned aspects, also incorporate themes related to creativity; proposals for the dynamisation of learning - which culminate in the **UrratsBat** program for the creation of companies by vocational training students - and, more recently, with the development of Education in Values, based on the proposal Values 4.0 for VET in Euskadi.

Over the years, some of these Learning Coordinators have taken on functions of a higher level and responsibility, as they become - from their experience in the classroom and in the Centre - dynamisers and facilitators of the work of/in other Centers. In this way, small networks of 5-8 Centers have been consolidated that have a reference in these teachers, who, in turn, coordinate periodically and systematically with the Tknika team.

In addition to the above, (in)formative events are held with the Directors of the Centers, as well as with the persons in charge of the Education Inspectorate. The latter is essential in order to harmonize - and make compatible with existing regulations - the new forms of programming and work in the classroom derived from the application of this new educational proposal; at the same time, it is work that must continue in the coming years, at the same time as the existing Curricular Designs are reviewed and updated with the people who are responsible for them in the *Instituto Vasco del Conocimiento de la Formación Profesional* **(IVAC)**.

The training and involvement of teachers is the crucial aspect on which new modes of action can be developed in the classroom - with the support and encouragement of the Centre Management and the Education Inspectorate being essential, and complementary to the foregoing. For this reason, together with the different training courses, and understanding that the objective is to put them into practice in the

classroom, from Tknika - with the support of people experienced in these tasks - there is a follow-up of each and every one of the Centers, and work days are organized with Learning Managers and Coordinators.

At the same time, and as an instrumental support of free access for all VET teachers, there is a **digital repository** that is being built and consolidated with the contributions of the entire educational community. This digital repository offers support to teaching teams in the following aspects:

- Context. This section provides a brief introduction to the model, its origins and its didactic-methodological framework.
- Digital competences. Without going into too much detail, it should be pointed out that a figure similar to that of the Learning Coordinator is being generated in VET Schools, which is that of the TIC Pedagogue, whose function is to dynamise - in accordance with the **European Framework of Digital Competences** (also dynamic and evolving) - the development of Digital Competences at these educational levels. Therefore, in this section teachers find - in addition to the definition and leveling of these Digital Competences - ideas, proposals and activities to work on them in the development of the different phases or moments of a challenge.
- Collaborative learning. In this section, teachers find, together with aspects of a more theoretical nature (who have already worked in some of the courses they have taken), ideas and tools to develop collaborative learning, create teams with different techniques, ideas of what can be an introduction challenge to this form of work.
- Challenges. As in the previous sections, in addition to a presentation of the topic in question - in this case, what is meant by Challenge and what are its main characteristics - there are formats in its two modalities: a) teachers, b) students - for its elaboration. The Bank of Challenges that can be found in the Institution will acquire increasing importance and will be consolidated with the contributions of the different VET Cycles and Centers in the Basque Country.
- Competences and evaluation. One of the main aspects of the ETHAZI model is that it is based on the development of technical and cross-cutting competences, which makes it necessary to identify them. The technical competences (and the learning results associated with them) are established by the basic curricular design of each cycle. On the other hand, the cross-cutting competences must be defined by each of the Centers; in order to facilitate this work - but with no intention of imposition - Tknika presents those which, over the years, have been consolidated as the most necessary in our environment. Thus, in this section you can find both the description and the leveling - based on rubrics - of these cross-cutting competences.

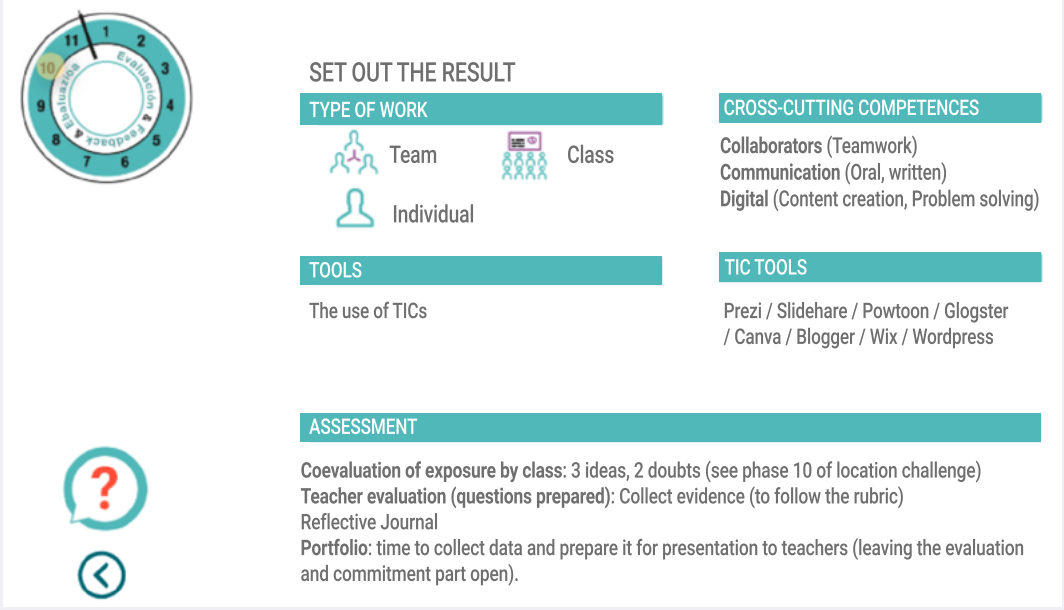
As mentioned above, another key aspect of educational change is the approach to assessment. In this section, you can consult the ETHAZI *Guide for the Evaluation,*

Feedback and Qualification in the Work by Challenges. This is a clarifying, helpful, and open document for the improvement and contributions of the educational community of VET in the Basque Country.

In order to facilitate the new assessment approach - centered on the evolution of students towards the achievement of competences - there is also a computer tool that offers multiple possibilities of work and consultation for both students and teachers. This tool, called **Skills Evolution Tool** (SET), is not in the public domain, although all VET Schools have access to it, and, currently, many of them already carry out the processes of evaluation, follow-up, feedback and qualification from it.

Likewise, in this section there is a dynamic infographics that allows, in a synthetic and pleasant way, to visualize multiple aspects for each one of the steps that, in a generic way, are developed along a Challenge (Figure 10).

Figure 10 - Dynamic infographics to support the development of a challenge



Source: Tknika

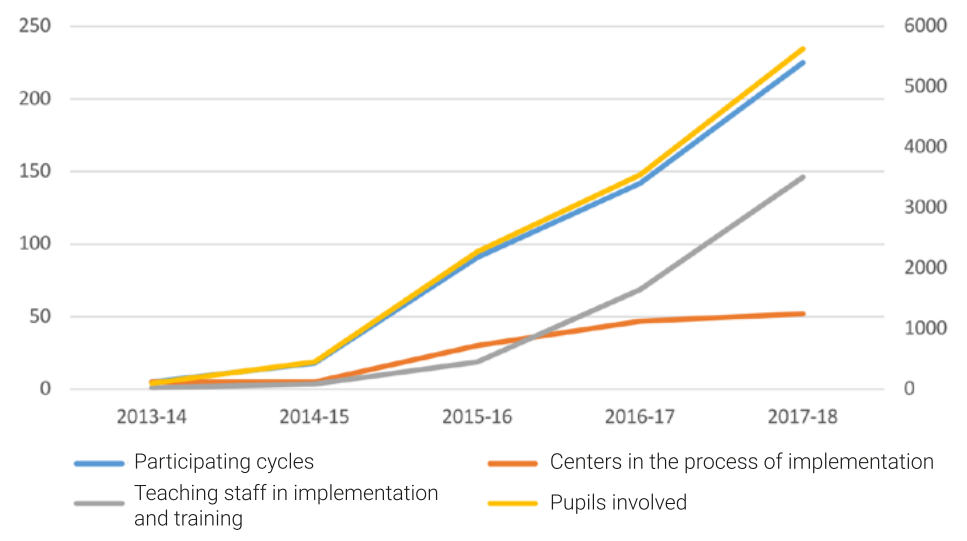
- eNOLA. In this repository, which we underline, it is in permanent construction with the contributions of the entire educational community of the Basque Country VET, also a self-diagnosis tool for the teaching teams of each Cycle (**eNOLA**). This tool seeks to encourage the reflection of each teaching team on the level of implementation of this model in their corresponding Training Cycles, which continues with the design of improvement plans.

At the same time, from a systemic point of view, the results of the diagnoses offer the possibility of deciding on the lines of action to be implemented in each course, since this tool offers information on five areas:

- Challenge-Based Collaborative Learning.
- Programming based on intermodular challenges.
- Evolution-oriented competency-based assessment.
- Self-managed teaching teams.
- Organizational flexibility.

In quantitative terms, Figure 11 shows the evolution in the implementation of this model over the last five school years, which clearly reflects the conviction of the Basque Country's Vocational Training Centers for innovation and change in their classrooms.

Figure 11 - Evolution of the ETHAZI program. Participating centers and cycles (left axis) / Pupils and teachers involved (right axis)



Source: Own depiction.

3. Final considerations

At present, the ETHAZI model proposed for VET in the Basque Country is presented as a useful tool that - through methodological change - seeks to respond to the changes that are taking place at the labor, technological and social levels.

In this context, it is necessary to continue with the generalization of the ETHAZI model to all the vocational training centers in the Basque Country; with the evaluation and monitoring of the impacts that the application of this model has at different levels in VET centers; the generation and/or adaptation of the challenges according to the particularities of each training cycle and of the groups of students who are going to work in them, always having the working environment as a horizon; the contrast with the companies for the validation and improvement of the model in order to respond

to their different demands; and the socialization and valorization of the results and conclusions of the implementation of the ETHAZI model.

Although the tool for self-diagnosis is still new for the Centers, among the data obtained from the self-evaluations carried out it was possible to appreciate that the teaching teams of 35% of the cycles offered in the VET of the Basque Country have carried out their self-diagnosis evaluations. In these cycles, programming based on intermodular challenges is highly developed and, in coherence with the above, collaborative learning based on challenges is a reality in most of the centers that have carried out the self-diagnosis. In addition, most teaching teams have modified and broadened their perspective of assessment, and are focused on the area of evolution-oriented assessment.

Most teaching teams have modified and broadened their perspective of assessment

It follows that it is important to work on three lines of action:

a. To deepen the quality application of the ETHAZI model in all the VET Centers in the Basque Country, placing special emphasis on the profile of the teaching staff, as well as on the aids and training required for the satisfactory implementation of the model.

b. To analyze the influence of other aspects (spaces, resources, organization...) on the development of the ETHAZI model, applying the improvements that may result in a higher quality of the model.

c. To assess the impact and repercussion of this training model for the new needs presented by companies, adapting it according to the results obtained.

d. Reinforce research for the improvement of Vocational Training in the Basque Country based on existing practices and realities, promoting the development of both technical and cross-cutting competences.

Notes

[1] From a historical and cultural perspective, we will also find references to the Basque Country (Euskal Herria, in the Basque language or Euskera) with a wider geographical scope, which includes the Foral Community of Navarra (in the Spanish state), and the Basque provinces of Southwest France (Lapurdi, Behenafarroa, Zuberoa).

[2] Throughout the text, it will be used to refer to the different people or professions mentioned, the generic words professor, teacher or student, and it should be understood that it refers to both the masculine and feminine gender.

[3] Some antecedents that led both to the creation of Tknika and to the change that the Basque Country's vocational training has undergone in recent years are included in Intxausti et al. (1999). Likewise, the first works mentioned in this article, which constitute the beginnings of the current educational model, can be seen in Astigarraga, Agirre and Carrera (2017).

[4] The bulk of initial VET training is organized on the basis of two-year cycles. Those of the Middle Level give continuity to Compulsory Secondary Education; those of the Higher Grade, are taken after the High School. In graphic form, the Educational System as a whole can be seen **here**.

[5] What is more, often under the same name reference is made sometimes to the methodological strategy, while on other occasions the specific methodology is referred to.

[6] See as an example: Johnson et al. (2009), Apple (2010), Instituto Tecnológico y de Estudios Superiores de Monterrey (2015).

[7] Evidently, here we point out those that a priori we could consider ideal; depending on the context, the educational level, the experience of the students in the development of this type of work, the moment of the course, the subject to be dealt with, the time available... these conditions are nuanced and contextualized by the teaching team.

[8] An example of this can be found at: https://www.youtube.com/watch?v=u9OKadUVLjs or more broadly: https://www.youtube.com/watch?v=CusOD9WdiIg&t=310s

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PROFESSIONAL TRAINING: NEW COMPETENCES IN EDUCATION INSTITUTIONS BY THE USE OF TECHNOLOGY[1]

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Abstract

The article is addressed first to the community of professionals in the area of Vocational Education and Training (VET), companies and their representatives, who seek for mutually beneficial formats of cooperation with educational institutions. It seeks to understand the situation in which the training results are applied and investigates the current needs of the market, considering the technological changes that demand new professional competences for the innovation of educational services. To do so, it analyzes projects applied by the methodology of a Russian educational institution.

Keywords: Professional training. Project moderation. Technology. Educational programs.

1. Introduction

The article was written during the reflection[2] of the educational program Managing the Changes in the VET System to Strengthen Regional Economy (Khabarovsk Territory), designed and implemented by Skolkovo Moscow School of Management from March to July 2018. The main objective of the program is to train VET management teams in *Srednyee Professional'noye Obrazovanie* (SPO) systems[3], capable of implementing new innovative educational programs in line with economic development goals in the region.

The project was implemented in the framework of the International Program to Strengthen VET Systems and Labour Markets in the Commonwealth of Independent States (CIS), Asia and the Middle East under the cooperation of Russian Federation and the International Labour Organization (ILO).

To answer the question "What does the industry really need?" is necessary to understand that the answer is not all time conclusive, and the question needs to be asked and answered from time to

time. Constant monitoring of the processes associated with market transformation becomes a mandatory task for management teams in educational institutions. This is the only way that schools can adequately respond to current situation and establish the requirements for the result and the product of their own activity. Without this analysis, questions about the transformation of the VET system, training content, and new educational technologies make no sense. Institutions capable of conducting such monitoring will become market leaders.

The article is organized as follows: it starts with providing rationale behind the need for transformation of VET system from a servicing to outpacing position. The subject of collective collaboration between colleges and industry representatives is considered in detail with focus on formation of unique technological competences. The inclusion of VET schools in this process will require them to change themselves. The following is a detailed description of Skolkovo educational program for VET management teams designed to clearly establish what VET schools should become and assess the possibilities of such changes. Before moving to conclusions there is a section describing the Skolkovo method in detail. The Skolkovo method allows responding to challenges and at the same time triggering irreversible changes, in this case, in the field of vocational education.

Educational institutions need to radically review the concept of the product of training

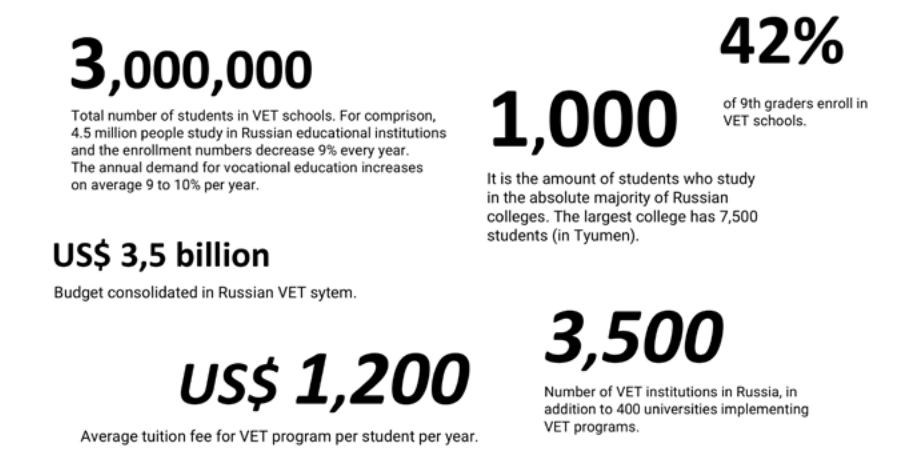
2. Industry schedule

The industry is going through a period of transition - the new industrial revolution is in full swing. New technologies, sometimes disruptive, are constantly changing market conditions, and as a result affect positions of the companies. Leaders are forced to run at ever-increasing speed in order to at least catch up to the changes. Why does it happen? This is what analysts and experts are trying to understand (RIFKIN, 2014; SCHWAB, 2017; SHCHEDROVITSKY, 2018). Traditional industries will either disappear completely or will be significantly transformed. New industries will emerge, and will probably assume leading market roles.

Thus, educational institutions need to radically review the concept of the product of training (“Who will be trained?”) for both existing industries undergoing transformation and new emerging industries.

The professional training system established in Russia and in several other countries in its current form cannot keep up with the changes that companies, organizations and corporations are going through. Providers of vocational education – vocational schools, and some universities – in all countries are often criticized and face corporate dissatisfaction. Most of the time, the criticism is due to the fact that the training programs are too long and, almost always, ineffective. Lengthy and ineffective training programs are produced as a result of lack of understanding among VET schools about the situation in the industry, and within companies where newly trained professionals begin to work.

Figure 1 - VET in Russia in numbers



Source: Skolkovo Education Development Center.

This lack of understanding is not rectified even by conducting foresight sessions to see which new professions will emerge as a result of technological changes, and what skills will be required in the future. Skolkovo School itself took the initiative to conduct a series of such sessions. As a result, **Atlas of New Professions**[4] was published describing which professions will seize to exist, which will emerge, and which skills will need to be trained. It seemed that this publication could be used as a perfect tool by VET schools to start preparing new qualified specialists. But it does not work that way. The training system that works in this way will be, with a high degree of probability, deficient and inadequate related to the nearest industry development horizon.

The inclusion of Russia in the international movement WorldSkills began to change perceived public notion of working professions and made VET schools and their programs more attractive. In addition to champion system used by WorldSkills, colleges also obtain annually updated international standard for work occupations, and if a country can restructure the training system that would massively train people adhering to “medal level”, problems associated with poor training quality would be partially resolved. This line of work remains important and will require educational institutions to have equipped management teams to lead their transformation.

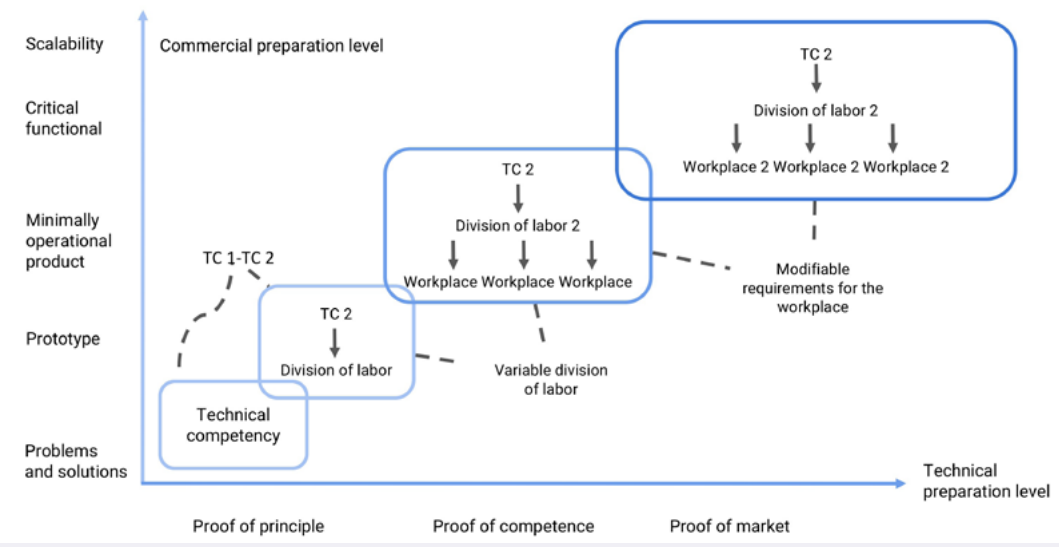
3. A new factor of competitiveness

First, considering the working hypothesis, “What should training institutions pay attention to and focus on to stay relevant and for their educational products to be competitive?”, the hypothesis was formed during the reflection of corporate training programs. How is competitiveness determined in the new conditions?

Skolkovo's experience with corporations and new businesses suggests that every company is looking for its unique skills - technologies or their configurations that allow one company to do what no other company, corporation or start-up can. At the same time, the set of "must have" technological competences that market leaders have is constantly being renewed. In addition, companies need not only have such skills, but also be ready to change with the speed that allows them to keep the leading market positions. With these competences, the company and/or corporation participates in the international division of labor. A set of "must have" and unique competences determines their place in the international division of labor: how high or low the margin is how promising it is.

For example, when visiting Airbus Defence and Space in 2016, the company possessed a unique competence - printing a satellite box on a 3D printer. None of the other satellite manufacturers did that at the time, it was their exclusive technological competence. It allowed them to redesign the product, which was impossible to produce using old equipment. Due to the special design, the satellite was made lighter and more durable – a series of expensive rework associated with traditional methods of metal processing was either excluded or reduced, manufacturing expenses and production time were also considerably cut. In many ways, the possession of this unique competence together with the availability of a "must have" set of skills and good reputation allowed the company to receive a request for the creation of the world's first large serial satellite for the One Web project.

Figure 2 - Levels of preparation of new technical and technological skills



Source: Own depiction.

Note: The scheme for the gradual development of exclusive competences was formed by Foresight participants in future competences (July 2018), conducted by Skolkovo Moscow School of Management, commissioned by the Ministry of Labor and Social Protection of the Russian Federation. The steps are determined by the technological readiness (TRL) and commercial (CRL) scales.

It is necessary to understand that each technological competence is in development. Companies try to follow every stage of development by launching a product based on that development, even if the technology is not fully finished. If it is possible to implement at least some function that already creates value for the user and client, they do so and launch an already usable product. The user is also involved in the development. The company reviews the user experience and makes changes to the product. Thus, each subsequent launch of a serial product may be different from the previous one.

It is necessary to understand that each technological competence is in development

This means that the development of technological competence goes through certain stages. At each stage, it is necessary to create a new system of division of labor, a new set of jobs, define new goals and determine the timeframe for achieving them. Once the necessary parameters have been met, it will be necessary to divide the work and provide new jobs and requirements for the personal skills of those who will execute it.

The requirements for the staff and the composition of the team are determined from the tasks of the specific stage of competence development: new stage, new tasks; new division of labor - new jobs. As a rule, part of the people move on from the previous stage, while some are replaced. Sometimes you need to change the whole team. In fact, each employee is interested in moving on to the next step, they are involved in the process of creating new jobs.

In the previous case of Airbus Defence and Space, it was also necessary to redefine the jobs and the composition of the team. The company was able to reduce the rejection rate with 3D printing by up to 20%. For the transition to the next stage of technology development, it was necessary to refine the engineering design of the 3D printer, continuing the development of the powder from which the product was printed, which would reduce the rejection rate to 3%, and in that trend to 0%.

To ensure this task, the company dedicated five years and assumed that the team would consist of several professionals capable of working in the same technological competence.

For example, they needed a chemist with relevant experience and knowledge; an engineer in charge of reducing the rejection to a minimum; a process technician who simultaneously solves the problems of scalability and integration of this technological redistribution in the old chain, as well as the exclusion of some old redistributions. In addition, due to the transition to 3D production, revenue and expenditure centers have changed, so a position with an old name but with new functions was introduced: the “marketing professional”, who redesigns the business model.

In the process of digital transformation of modern production, the Chief Digital Officer (CDO) usually takes part in the team, who, in this example, needed to manage the 3D printer and ensure that it was equipped with the necessary sensors, allowing information to be received.

Thus, as stated earlier, at every stage of technological competence formation, the system of division of labor, the workstation, and the requirements for personal competences change. To provide technological competence with needed labor, it is necessary to be able to assemble a team composed of professionals from different training areas but gathered for tasks related to the same technological competence. It is also very important to anticipate the life expectancy of workplaces and plan career development paths for each professional or team as a whole.

4. Challenges and opportunities for VET system

4.1 Need challenge

In general, it is believed that the professional education system trains a person to assume a specific job. However, nowadays, this is not enough: you have to be able to train professionals who will ensure the technological competence of the company. And this means that, in addition to performing their direct professional duties, they will have to communicate with other professionals who ensure the development and updating of this competence. At the same time, it is also important to take into account that any specialist, throughout life, sometimes needs to change jobs. Even if the work task remains the same (if one was a chemical, he can still be a chemical), he/she will have to change the job at some point in time. Nevertheless, even if he does not change the job, he will certainly change the position itself, i.e., in any case, he will have to be able to do something else. This means that VET must work not only with the professional skills and qualifications, but also with the possible career trajectories, both within the same professional area and beyond its borders.

You have to be able to train professionals who will ensure the technological competence of the company

4.2 Efficacy challenge

How much does a specialist with this set of skills cost? How much time and money is spent to train such skills so that it is possible to provide corresponding jobs for a given stage of the technology life? In Russia, the State is responsible for training the majority of specialists. Data produced by the Skolkovo Education Development Center show that the government spends an average of US$ 1,200.00 per person per year in training and, for some specialties, up to US$ 5,000.00. For most technical colleges, the cost of training ranges from 2 to 3 thousand dollars per year, with a standard training period of four years. However, technological development suggests that the increasingly important factor is not even the cost of training, but its accuracy and speed.

Reducing time and changing educational formats inevitably leads to the increased cost of training per hour. And this, ironically, is beneficial to all process participants,

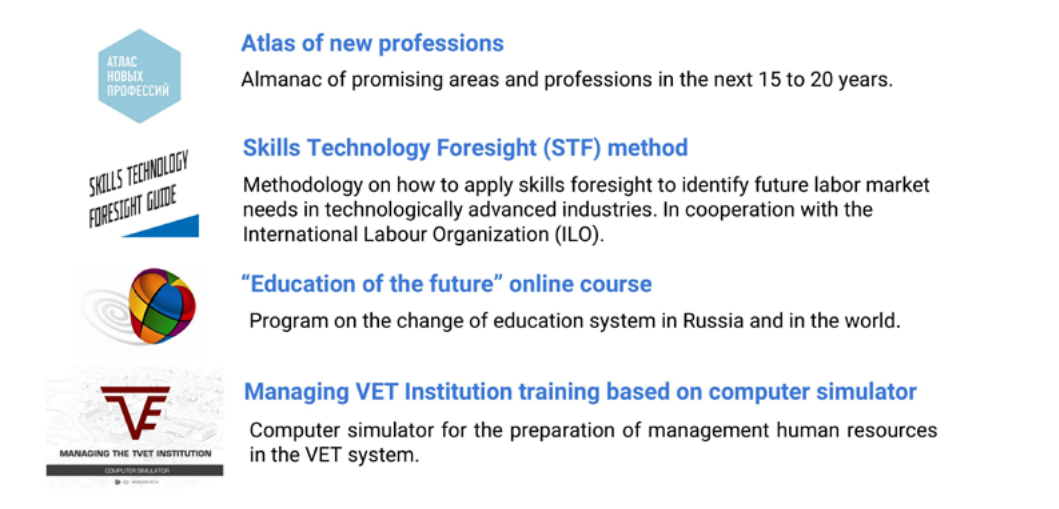
because it increases its effectiveness: the labor market regularly receives required specialists, competition is increased; companies receive high-performance employees and the possibility of more aggressive and flexible modernization of production processes; As a result, companies can pay more to educational institutions at a comparable or even lower total costs. The benefits to students are also obvious: faster access to the labor market, increased demand due to inclusion in the processes of technological development and modernization, gain of unique experience and, consequently, a more attractive career path.

5. New opportunities for VET system

In the past, the goal of the VET system was to provide a student with professional specialty that would be sufficient through life, a specialty that would stay the same until retirement (possibly with an increase in the hierarchy and level of responsibility, but usually in the same area). Nevertheless, the system should be centered around the student and his Life-Long Learning (LLL) philosophy. The VET system becomes more than just a provider of professional education, to be something the student can come back to at any time. Thus, there is a change of paradigm: the focus now is not competence and qualification, but the person itself. The person and his/her career trajectory.

Educational organizations that choose this path demonstrate greater competitiveness in professional training. The numbers confirm this: the university enrollment rates drop by an average of 9% a year, while the number of students enrolled in vocational education institutions grows annually by 9-10%. How can one use the emerging new opportunities and respond to new challenges?

Figure 3 - Skolkovo expertise within VET



Source: Skolkovo online page – www.skolkovo.ru

6. The international training program Managing the changes in the VET System to Strengthen Regional Economy, a pilot-project for the Khabarovsk Territory, at Russian Federation

The key goal of the program was to train management teams in leading regional VET schools capable of developing and implementing innovative educational programs to form the necessary technological skills in the region, and thus guarantee the competitiveness of the region's leading businesses. However, how to accomplish this? It is necessary to have sufficient expertise about the priority markets and to assess the potential for growth in these markets. Also, it is necessary to have a great deal of expertise on new and emerging technological packages that can provide a qualitative breakthrough, predict the timing and main tasks of each development stage of the technological package and at each stage have a version of the (future) jobs that will be necessary with their respective requirements for future skilled workers. Only when possessing all of this information, it becomes possible to answer the question about how to train people.

The emergence of new technology immediately changes the situation in markets, which directly influences training requirements

The linear world has collapsed because it is impossible to work in the system where a process participant - a business or industrial partner - will determine the priority market; and then the technology partner[5] will formulate the technical task for the necessary technology and develop such technology, make a prototype, and develop the technological line. The manager will determine which jobs will need to be created and formalize a request for the personnel training, and then the college will develop an educational and methodological complex, complete enrollment and conduct training for several years.

Nowadays, this system has no more consistency, everything happens in parallel and everyone influences one another. It is further complicated by the fact that the market situation is changing, and market rates are being specified all the time, changing the requirements for technologies and training specialists. Plans for launching new technologies are also uneven, often unpredictable, and the emergence of new technology immediately changes the situation in markets, which directly influences training requirements.

A demand for professional training arises: to keep up with the changes, you need to be a full participant in this process together with business and technology developers. At the bare minimum, this means having your own strategy, understanding the value that the education institution creates/can create for other participants and be ready for the change. If today development drivers are a business strategy or technological innovations, then the question arises: "Can the professional training systems itself act as driving forces of change? In addition. How should the training systems be reconceptualized?"

Having formulated these problematic issues, Skolkovo's proposal was to conduct an educational program for the management teams of professional education institutions that are interested in designing an active response.

6.1 Main steps of the work

Each step of the work was moderated, monitored and provided with complementary expertise from practice teachers, specially invited international and Russian experts and Skolkovo expert team.

At the beginning of the program, a foresight session was held, aiming to predict technological changes and skills required for the regional priority sectors, with the broad involvement of representatives from industries, developers and suppliers of technological solutions, as well as representatives of training and education development institutions. The foresight was carried out in the light of global trends of transformation of industries, markets and technologies.

Next, a competitive selection of VET schools wishing to participate in the program was conducted. In total, seven teams were selected. The VET development teams analyzed each of their activities for the development of markets and scenarios for the development of technology. As a result, the strategic betting hypothesis was formulated in each of the activity area. The hypothesis was discussed, criticized and clarified in dialogue with representatives of regional companies, governmental authorities, employers' associations and development institutions.

The teams had to critically analyze their institutions, as well as their own conditions, capacities and ambitions. As a result, they formulated the strategic assumptions of the business. The hypothesis was also criticized and clarified in a dialogue with an industry partner, a technology partner, as well as representatives from regional companies, government authorities, employers' associations and development institutions.

At the same time, the preparatory work was started and the design of the new innovative educational programs continued, a hypothesis of which became the main theme of cooperation between schools and industrial and technological partners. The program dealt with Russian and international benchmarks, examples of best educational programs and their implementation plans were discussed. The negotiation platform was also established, where management teams discussed new programs with their partners, and where new partnerships were formed under the scope of new programs. VET schools have begun testing individual elements of new programs that were being developed and working on functioning pilot versions. In addition, program participants analyzed the results of several studies on future skills and new educational technologies.

For designed training programs, which are based on innovative principles, the recruitment of new staff and attraction of new resources is required, so there are always threats from representatives of the "institution's old corporate culture". To

eliminate these threats, a new organizational design is required that would support the implementation of new innovative training programs. Only after making sure that all conditions were met, the teams, supported by partners, presented their programs to experts for consideration and approval, and proceeded to make steps towards implementation.

Table 1 - Themes of new innovative programs (Khabarovsk Territory)

Name	Partners
Digital agronomy	Russia's largest agricultural producer.
Industrial design	Major corporations in aircraft manufacturing and shipbuilding.
Cross-border logistics	Professional education institutions in China and Russian and Chinese logistics companies.
Remote administration of mining automation	Russian mining companies and universities.
Operator in unmanned mining complex field	Mining, processing and mineral enrichment companies. Companies that offer digital technology and technological solutions for automation and robotization of mining companies. Specialized technical colleges from Siberia and from the Far East of Russia.
Modern mechanical engineering technologies	Machinery construction plants of the region under the process of modernization of production. Major global manufacturers of steel and welding equipment, as well as equipment control systems.
Energy efficiency solutions in housing and utilities (water, electricity, gas)	Management companies. Suppliers of equipment and materials for the housing market and utilities services. Regional University.

Source: Own depiction.

Seven coordinated pilot programs with partners have been scheduled for launch in Fall, 2018. At the same time, the regional administration will organize discussions on the possibilities of forming a regional ecosystem that supports the formation of unique technological competences in the territory. Works were announced about the development of maps of exclusive competences required in the territory, involving representatives of regional technology companies.

6.2 Intermediate conclusions

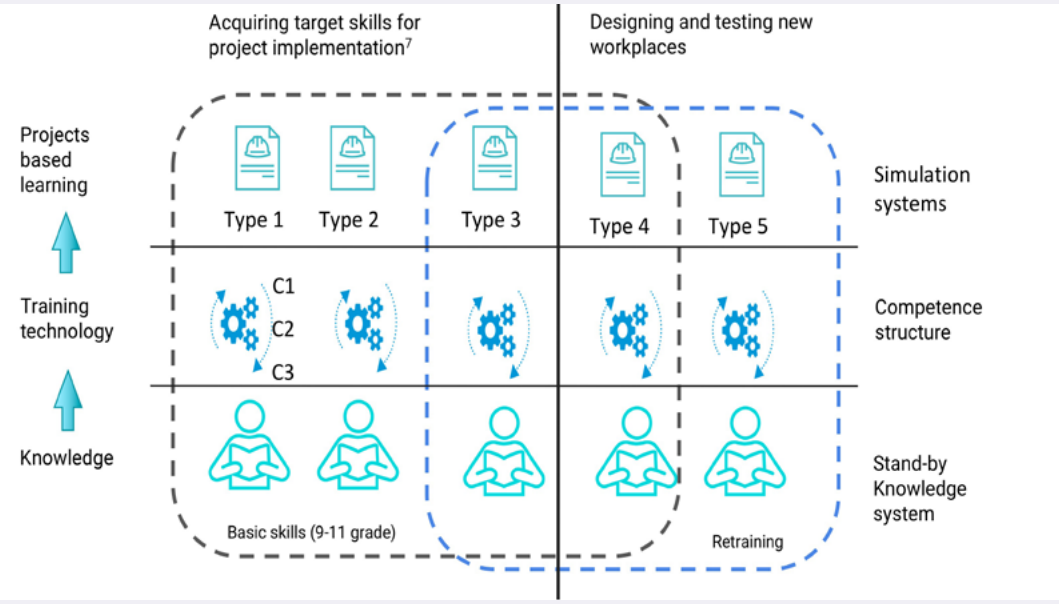
It is important to mention key general solutions established by management teams while developing new educational programs:

- The competence structure in new developed training programs differs from the competence structe adopted by VET schools. As a rule, in addition to the core professional skills required for the future job, the new competence structure must contain general professional skills. It should also include soft skills, such as teamwork, communication, self-education, decision-making, etc. In addition, the new competence structure gives special attention to the so-called "corporate competences", directly related to the corporate culture of the company or organization, in which the student will continue advancing his/her career.
- Modular training format: each module has a limited term, focused on a certain skill, ability or concept. The presence of a large number of effective modules allows to implement individual educational programs. In addition, each module or a combination of modules can be introduced by the VET school in the additional education market as an independent product, providing additional financial sustainability and supporting the educational and professional trajectory of specialists, implementing the LLL principle.
- The team project method is the basis for choosing content of all new programs. The typology and sequence of the projects that are being implemented establish the requirements for the necessary academic and practical content.
- The new programs should establish strong ties and be closely connected with industrial partners and suppliers of technological equipment.
- The students enrolled in training have an opportunity to advance their career during their studies. Success in project activities and academic affairs directly affects student position during their company-internship and define career advancement opportunities while still in training.
- The system of division of labor among teachers becomes more advanced. New requirements for teaching and management staff require the introduction of new positions, such as tutor, mentor, project manager, technology specialist, etc.
- With no exception, each VET school established partnerships with universities and research centers. The access to applied research is known as one of the critical factors for the formation of unique technological competences. In fact, VET schools have entered into the zone of activity traditionally occupied by the applied bachelor's degree in higher education.
- The teachers center their attention around students and their learning and career trajectories. The institution's position shifts from merely supplying industries with skilled workers towards servicing student's life-long interests. Thus, it acts as an assistant in advancing their careers through life. Students come back to VET schools for new competences at each new stage of their professional lives.

6.3 Working model of the new innovative program's individual study plan[6]

Developers of new programs can use this model as a special scheme of organization and activity that allows planning educational programs jointly with students who attend them. From the previous discussion, it is already clear that one must proceed from the affirmation: the learner is the subject of his own learning. The model (see Figure 4) contains the following logic.

Figure 4 - New innovative program: model of the individual learning plan



Source: Own depiction.

The basic level is the level of projects. During the main program, the student does several assignments and target projects. Each type of assignment has its own purpose. Some are designed to equip students with certain skills, some are conducted to help students understand and become engaged in the corporate culture, while others are designed to enable students to make a product demanded in the market, and to feel satisfaction from making a needed product.

Thus, the new developed program for industrial design assumes that the student must be constantly involved in five target activities - conducting research in the city where the school's target audience is located, finding a problem, developing a technical solution, implementing and transferring their products to the end-user. As an example, the **project of the students from Olin College of Engineering** (Needham, Massachusetts, United States). The objective of the project was to assist people with disabilities in solving weight control problems. The presence of a wheelchair makes this procedure extremely difficult. A team of students designed scales easily accessible by wheelchair and created a mobile application that can weigh different

types of wheelchairs. The product was delivered to the target group and then actively used. Thus, students learnt to feel pleasure from their work.

The second level is the level of simulators. All of the necessary skills acquired by the students are strictly aligned with project work. In other words, students master skills and competences necessary for successful implementation of the developed project. Different types of simulators allow students to master the logic and mechanics of the work already done. The reproduction of certain actions form new skills.

Knowledge is transmitted and academic subjects are taught in order to support main activities: program design, and where necessary, to master skills. First, it is important to formulate a query. It is called inquiry-based learning.

Forming representation is one of the key activities of professional training

This research has found a similar attitude towards educational disciplines in Chinese schools, where a stage of design work is supplemented with simulations of typical and non-typical production situations students are likely to encounter in their work environments. In addition, production situations are divided into lessons and elaborated on via computer simulators. Only the necessary information and knowledge is communicated.

However, unlike the Chinese model, research has considered the key stage of design work - work with representations. The representations are formed with the help of teachers, representatives from industries, industry-mentors, tutors, and moderators rather than being merely presented to students. Forming representation is one of the key activities of professional training and is conducted through special procedure, repeated at each stage of the training and the reflection.

The domain of the objective work, during the design mode, must be done in a safe format (by simulation/imitation), in the first step, allowing the student to see all his/her mistakes. For mistakes to be translated into knowledge of activity, they must be reflected, i.e., reinterpreted. This is the second most important function of reflection.

Finally, the key point of this model. Part of the projects has a specific focus: training, approval, it might be said, the experimental exploration of new jobs. This is the new product of new programs - the ability to create structures for new jobs to solve problems - in other words, the ability to create the right jobs. This means creating tasks to solve tasks corresponding to the stage of development of an exclusive or must have competence.

This model does not address the issues of interaction and involvement of industrial partners. These issues are important, but they are well-developed in the **dual learning**[8] model. The industrial partner[9] is actively involved in the implementation of projects, some of the competences are trained using company simulators, and then applied in the production, and some requests for required knowledge are addressed directly to the industrial partner. In addition, the experience of engaging companies in the development of new programs has shown that VET management teams are capable of close cooperation with industrial partners and easily accept

their corporate culture. This cooperation and common corporate culture enables VET schools to deliver meaningful solutions to the next stage development goals of the company's unique competences, which makes such partnerships ever more attractive to companies.

7. Developing the design method

The Skolkovo Method is a collective, problem-oriented, highly engaging, a large group approach to addressing the issues of structural development, or, as Skolkovo experts like to say – to 'constructing the future'. It is gamified in the sense that the result is never known beforehand. The Skolkovo Method is also sometimes called Future Programming Machine (SKOLKOVO MOSCOW SCHOOL OF MANAGEMENT, 2018).

The educational program for VET management teams in Khabarovsk Territory was built on the same basic principles that Skolkovo uses when developing all educational programs[10] - whether they are for corporations, municipal or regional authorities or for universities - hence the importance to outline these principles.

The Skolkovo Moscow School of Management implements business education programs. Generally, participants in such programs are managers involved in making strategic decisions for the development of a company or organization. Most of the Skolkovo programs are created in a design method, making them more effective. In addition, despite the young age of Skolkovo School, some of its programs have already been recognized by international professional communities and awarded with prestigious awards.

Figura 5 - International awards of Skolkovo programs based on PBL methods

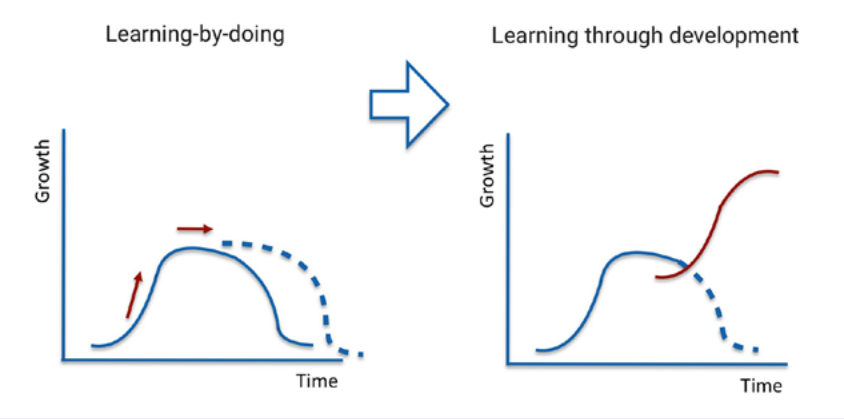
Source: www.skolkovo.ru

The project method is different from Project Based Learning (PBL). While preserving the problem objective principle, the first difference is in design. The most successful educators usually use the design method in teaching, implementing its main principle-learning-by-doing. This is particularly useful in developing non-management activities.

Management activity is associated with identifying the main problem and changing the approach to the real state of affairs. To transform the activity itself, the order is to change the opinion and the ideas about the subject of the project.

The main principle of the design method practiced at the Skolkovo School of Management is Learning-by-Strategic Development. In this view, participation in development processes results in the best educational outcomes.

Figura 6 - Main challenge upon business education



Source: Own depiction.

The greater the ambition, potentially more the educational effect. It is necessary to take into account such problems by solving which the professional or student develops.

The complexity of Skolkovo programs is a consequence of this premise – each method-based program deals directly and simultaneously with two design objects: the activity development project and the team capable and in charge of implementation of the development project.

Two design objects require significant efforts. In this process, it is not clear whom the student and who the teacher is, which results in subsidiary responsibility. The quality of the idea adheres to the highest standard – any information not considered at the elaboration/inception phase might result in project implementation failure. Indeed, in different stages, everyone participates in the same team but assume different roles and positions. The moderators of the project work[11] become co-designers. Thus, the school assumes its share of responsibility for the projects implemented by its graduates.

Strategic development project is the main subject of the project method

7.1 Development project

Strategic development project is the main subject of the project method, because it incorporates the image of the future, the next development step for the company and its activities. In the case of educational program for Khabarovsk region, management teams designed development projects for their institutions.

The key, must-have characteristics of the strategic development projects are:

- Strategy: the project must solve a non-trivial (large-scale) task of the company and must be aligned with the corporate strategy.
- Subjectivity: the project should require participants to be entrusted with its implementation.
- Problem: every project should be intended for eliminating a fundamental gap in the management system, which is a significant barrier strategy implementation.

7.2 Prerequisites for applying the project method

Managers need to develop throughout their lifelong learning.

From a certain point, for managers it is not enough (or is redundant) to improve their qualification, it is necessary to develop competences, especially in the field of management thinking.

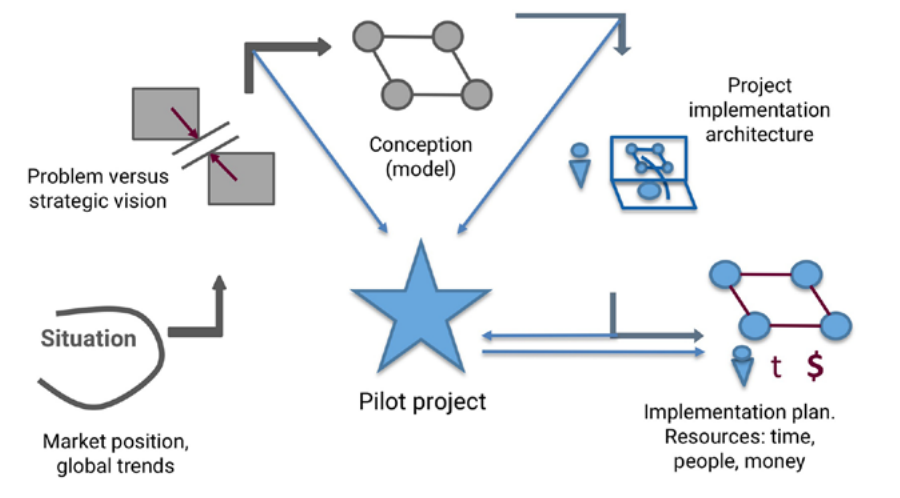
The ultimate horizon of managerial thinking is to think actively about the future.

The only way to develop managerial thinking is to master the thinking processes required and enter a management position. This is only possible in practical activities, for example, in the creation and implementation of a development project.

7.3 Steps of the project work[12]

The work in the project is carried out in a certain order. Figure 7 shows the main phases:

Figura 7 - Steps of the designed work



Source: Own depiction.

Note: The steps of the project work were proposed by A. E. Volkov, the first rector of the Skolkovo Moscow School of Management. Since then, they are the technological core of the design method. They were then refined and developed by N.S. Verkhovsky and B.M. Ostrovsky.

The work is carried out in two modes: modular and intermodular. During the modular mode the participants are fully involved in the project work, they are separated from the usual day-to-day operations at their institutions. During intermodular mode participants go back to their institutions but continue to be in close contact with moderators and experts via different electronic platforms. At the end of each module, participants present their projects to an expert committee composed of managers and specialists, receive feedback about the quality of the project and recommendations for its development, which they take into account in the intermodular period.

Project development requires constant communication with various stakeholders – technology holders, experts, potential customers and partners. Thus, the project work is transformed from an academic exercise into a practical work, preserving theoretical elaboration and mental depth.

7.4 Roles in the design process

7.4.1 Moderator

Each group leads its own project and its work is accompanied by a moderator, whose functions are:

- Organization of effective communication in the group.
- Supplying of the thinking tools required, design and communication to the group.
- Arrangement of the work plan of the group and transmission of the most interesting findings of the group work in the communication space of the entire educational program.

The moderator has the key position in the design. The essence of the work of this position differs from the discussion moderators at conferences. The moderator simultaneously assumes different roles – a project engineer, social engineer (interpersonal skills), coach, planner, methodologist, and sometimes an expert in the topic of a group project.

7.4.2 Curator (sponsor)

The design work aims to develop projects that need to be implemented. To ensure successful implementation, it is assumed that there is a curator (sponsor) of the project that is a member of the company. The curator, as a rule, is appointed by the upper management of the company, and it is usually a representative of a senior management – an industrial partner.

Curator's role:

- Synchronization of the project objectives with the strategic objectives of the company.

- Examination and approval of the project with the team.
- Supplying the group with specialized knowledge.
- Provision of necessary resources (administrative, communicative, including participation in financial decision-making) for project implementation.

7.4.3 Project team members

The project team consists of five to nine participants, and is formed based on three cornerstones:

- Skills required for the development and implementation of the project for the selected topic.
- Ability to assume the roles needed for successful teamwork at each step (the role structure can vary from step to step).
- Personal interest in successful implementation of the project.

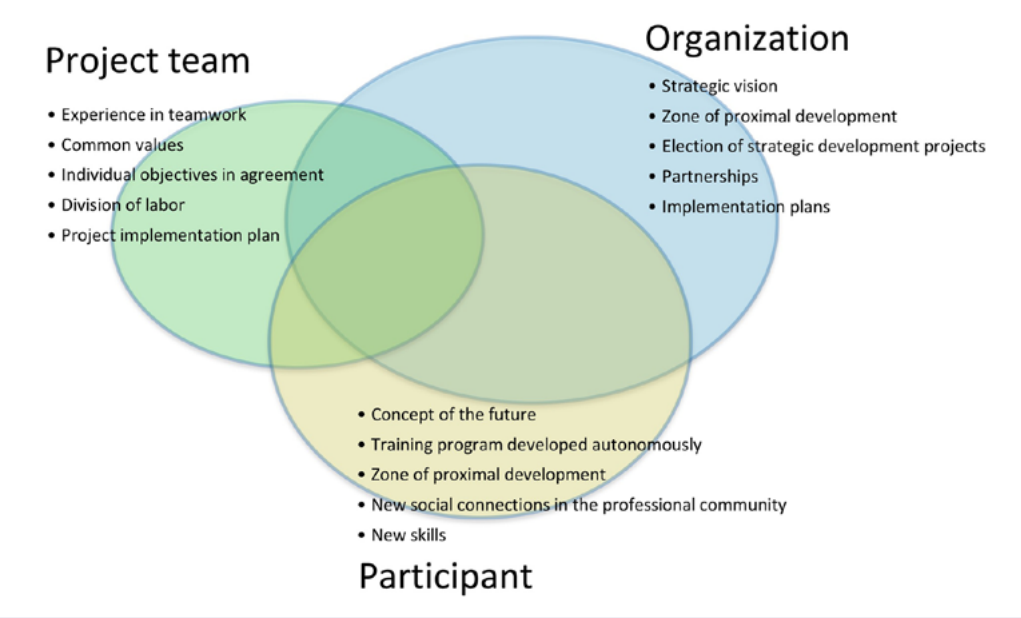
7.5 Results of the program

As a result, each group that follows the results of the program should have:

- Subject and group composition are defined. Situation analysis is conducted.
- Description of the strategic objectives within the subject of the group, both in conceptual (visionary) and outlined (digitized) approach.
- Description of the problem situation, impeding the achievement of strategic objectives.
- Description of the project idea, possible means to overcome the problem situation.
- Project implementation plan and its schedule, with the map of the necessary resources.

Different projects in the same program may imply a different time horizon for implementation. Part of the projects can be implemented at the time of the program, and then they are used in the defense of the immediate results of the project described as a case. However, most of the time, the project requires a long period for preparation and launching and the results can be obtained in years. In this case, the project team tests the feasibility on a small scale and prepares a pilot.

Figure 8 - Results of the program

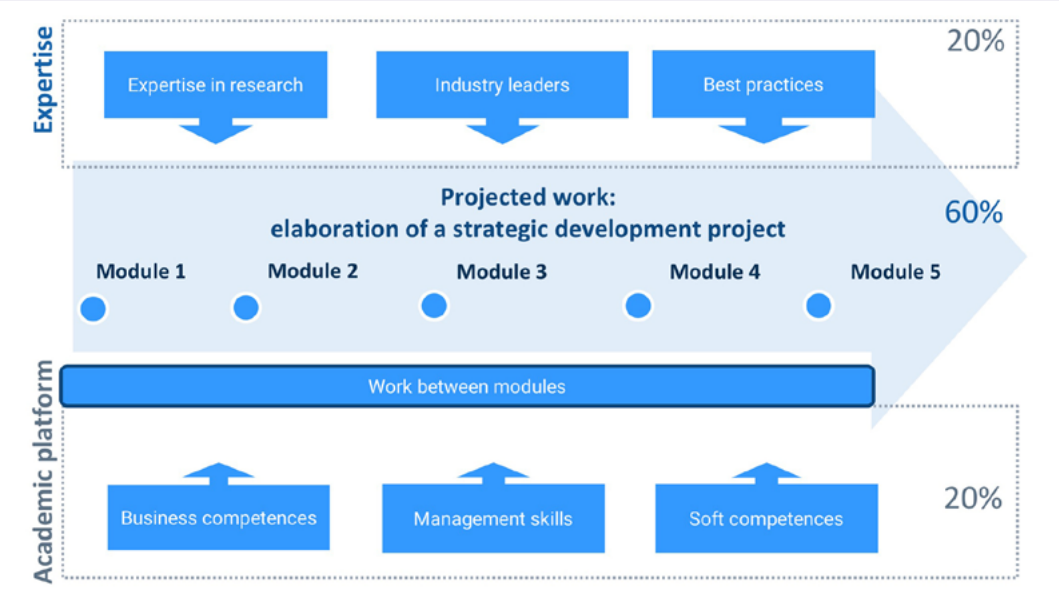


Source: Own depiction.

8. Educational plan construction[13]

The program consists of five stages, each representing a full-time module (five full-time days) and an intermodular period.

Figura 9 - Program design



Source: Elaborated by the authors.

Each module ends with a reflection of the obtained results, and intermodular group work objectives are defined. During the intermodular period management teams collect the missing information and conduct negotiations with their industrial partners that are affected by the project, attend meetings with external specialists and stakeholders. An important part of the intermodular period is the examination of the project's intention, whether the proposed solution solves the problem and, at the same time, ensures the achievement of the strategic objectives. In the intermodular period, the group curator usually works closely with the project team.

9. Further development of the design method

At present, in the practice of the design work of the Skolkovo Moscow School of Management, several directions have been outlined for the realization of peculiar laboratories in which experiments are conducted and the design method is being developed. It is possible to highlight the five most promising guidelines implemented:

- Problematization is perhaps the most valuable part of the design method. The accuracy and depth of the problem is half the solution. The ability to problematize is not so common. The work on the technological gain character of the collective formulation of the problem was discussed by G.P. Shchedrovitsky. In this direction, there are works of research, quite current.
- Positional communication. Perhaps, the most effective and promising "engine" of the design method. Experiments on positional communication tuning are conducted in corporate digital transformation programs, university management, entrepreneurship training programs, and the VET management program.
- The emphasis is on the feasibility (effective reproducibility and scalability) of the programs being developed. It is the technological development of individual steps of work design in the programs about the method and formats that provide efficiency. Experiments are conducted with formats and ways of working. Various didactics are developed.
- Proximal development zone. The idea is that the project concept that fits the zone of development closest to the company and the participants provides the most powerful qualitative increase to all. This can be empirically observed. There is an issue of tools and methods of working with the development zones closest to different participants and organizations. The very idea of proximal development zone was formulated by L.S. Vygotsky with reference to children's development. Nowadays, this idea works also in the andragogy and in the strategic development of the companies.
- Preparation of moderators and project managers. This direction appeared on the basis of increasing practice scale and the need to describe and introduce dynamic professional practice standards. This is the formation of a professional department. In addition, there is an important discussion about which path to follow in the moderator's profession.

Figura 10 - Community of graduates from the Skolkovo Moscow School of Management

Source: Own depiction.

Note: The educational curriculum project was originally developed by A. P. Zinchenko, and finalized by A. E. Volkov and O. L. Nazaykinskaya.

10. Final considerations

Nowadays, the boundaries between secondary and higher professional education are indistinct. Under the current conditions of rapid technological changes, the professional education system can and should be built as a full participant in the region's social and economic development strategy. Now, there is an opportunity for technical education institutions to move away from the usual service paradigm, in accordance with the residual principle, and position themselves actively in the market and compete with universities.

For this transition to happen, VET schools must have a strategy. This means that vocational education institutions should stop merely servicing the existing employment system and enter into communication zone with other parties interested in their training. Otherwise, they will lose track of changes and will become utterly irrelevant.

In Russia, as a rule, VET schools are considered the "younger brother" of universities, or as schools designed for less promising students. However, current conditions push vocational education institutions to compete in the market of educational services and they need to absorb research and humanitarian competence. Interestingly, VET schools have a number of competitive advantages - proximity to industries, applied training nature, speed and cost of training.

New educational programs are the main driver for the development and re-positioning of vocational education institutions. The competence to create new programs was largely lost in the post-Soviet period. Under the new conditions, if the educational institution does not have new programs, it will lose its place in the market, resources and the target audience. Going back to competent institutions to

create new training programs is a key factor for success. In the same way, as for other teaching institutions, it is important to face the challenge associated with the dynamism of jobs and related specialties.

The concept of LLL is directly related to professional education. In this respect, the demand for soft skills is significantly increasing and the short programs, that can be assembled like Lego can become the key market for VET schools.

Notes

[1] The authors are grateful, for the discussion of the theses of this article to Andrey Sadakov, moderator of the project work of the SKOLKOVO Moscow School of Management, and to its team: Andrey Volkov, Nikolay Verkhovsky, Olga Nazaikinskaya, Dara Melnik, Andrey Sergeev, Stepan Galushkin, Konstantin Shevchenko, Svetlana Bantos, Anastasia Pyshkina, Mark Mamrykin, Natalya Nikitina, Stepan Galushkin and Zinaida Vorobyeva.

[2] Reflection means after action review. It is the analysis of the action performed, its effectiveness, which is associated to the allocation of methods of action, its problematization or consolidation. It is a fundamental tool for building skills.

[3] It is important to note that in Russia, the SPO system, which refers to Vocational Education of High School or Secondary Education, is carried out on the basis of the elementary school (9 years) and above. The SPO conducts both two to four-year training programs as short programs in supplemental education mode. The SPO also conducts recycling programs for specialists.

[4] The *Atlas of New Professions* is an almanac of promising areas and professions in the next 15 to 20 years. It consists of a joint project of the Moscow School of Management SKOLKOVO and the Agency for Strategic Initiatives <atlas100.ru/en/>

[5] Technology partner is a company, a manufacturer or supplier of solutions and technological equipment. The partnership provides education institutions with demonstration equipment, simulators, and training programs for the job. The technology partner is interested in working with schools to promote their technologies in the market.

[6] The new innovative program provides market positioning and implementation of the education institution's strategy. As a rule, it is based on new technological solutions, ensures the formation of exclusive competences and is based on a new package of educational technologies.

[7] Objective works are, in the context of the development of an individual curriculum, a special type of project training organization. It is applicable in the step of mastering basic skills. Unlike the projects, perhaps, they do not yet have all the necessary resources.

[8] The Russian language version of the dual learning method is available for consultation on the website of the Agency for Strategic Initiatives: https://asi.ru/upload/0b6/Metod_dualeducation_full.pdf

[9] Industrial partner is a company or organization in the industry for which the education institution prepares human resources. In most cases, the industrial partner is a potential employer for graduates and provides vacancies for practice and internships for students. Likewise, when the company's employees act as teachers, mentors and tutors, the company's production problems are the subject of projects developed with the students. Generally, the interest in partnership is confirmed by the existence of financial relationships.

[10] The Moscow School of Management Skolkovo Program is based on the design method and in the development ontology. A distinctive feature is that the educational effect is achieved in the course of the collective development of strategic projects, which assumes positional coorganization. At the core of the program is the problematization process (an analysis of the situation that leads to a qualitative identification of the problem that the project aims to solve).

[11]Design work manager is the organizer of the design process in the group. He/she is responsible for the quality of the situation analysis and problematization, acts as a source of problematization of the current ways of working in group and is a source of new resources, initiates and follows the process of changing concepts and representations in the group and outlines the group work.

[12] The steps of the project work were proposed by A. E. Volkov, the first rector of the Skolkovo Moscow School of Management. Since then, they are the technological core of the design method. They were then refined and developed by N. S. Verkhovsky and B. M. Ostrovsky.

[13] The educational curriculum project was originally developed by A. P. Zinchenko, and finalized by A. E. Volkov and O. L. Nazaykinskaya.

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PROJECT-BASED LEARNING IN GERMAN VOCATIONAL EDUCATION AND TRAINING: A STRUCTURED APPROACH TO DEVELOPING SELF-DETERMINED, COOPERATIVE PROBLEM-SOLVING COMPETENCE

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Abstract

The implementation of project-based learning in Vocational Education and Training schools in German started in 2005 and the endeavor has crossed borders to application in other European countries too. This research shows empirical results of how students and teachers perceive this approach and settles statements about the intention of project-based learning. The article shows contextual conditions, problem statement, state of the art, and theoretical framework. Moreover, points out the project-based learning as a combination of cooperative team learning and self-determined learning embedded in two wider approaches: the cognitive apprenticeship model, and the project management methodology.

Keywords: Vocational education and training. VET. Project-based learning. PBL.

1. Introduction

This first section based on Gessler (2017) due to describe contextual conditions, such as the basic structure of the dual apprenticeship system in Germany, the objective of vocational education and training (VET), the reforms that created the supporting conditions for implementing project-based learning in VET, and finally, the problem statement.

1.1 The dual apprenticeship system in Germany

In Germany, the dual VET system operates in parallel in both real-world work environments (where students normally spend 3–4 days a week) and vocational schools (normally 1–2 days a week). There

are statutory regulation documents for goals, content, and timetable structures for VET in both learning environments: companies are governed by training regulations, the vocational schools by framework curricula. Table 1 provides an overview of the structure of the dual system of vocational education and training in Germany.

Table 1 - Jurisdictions in the dual VET system

	The dual system of vocational education and training for approximately 330 recognised vocations		
Learning location	Company		School
Regulations	Training regulations		Framework curriculum
Focus	Vocational training		Vocational education
Jurisdiction	Federal government		State government (comparable with states in Brazil)
Statutory basis	Industry	Craft	Individual federal states' education acts
	Vocational Training Act	Crafts Code	
New and further development of regulations	Federal Institute for Vocational Education and Training (BIBB)		Standing Conference of the Ministers of Education and Cultural Affairs of the Länder (KMK)
Appointed experts	Industry and craft representatives		Teachers and school representatives
Solution of separated jurisdiction	Joint agreement since 1972 between the federal government and the KMK/ state governments on coordinating training regulations and framework curricula		

Source: Gessler (2017, p. 697).

During the 1980s, school-based education within the German dual VET system saw heavy criticism, with industry representatives asserting that school-based education was disconnected from reality and did not prepare students to tackle the challenges of working life in companies. In other words, schools were not oriented toward the customer.

1.2 Competence to act

On 14 and 15 March 1991, the Standing Conference of the KMK passed a framework agreement for VET schools: vocational schools should develop skills by combining technical competence with self and social competence (KMK KULTUSMINISTERKONFERENZ, 1991; see also RAUNER, 1988). They also should provide basic and specialised vocational education that builds upon previously acquired general education, with the aim of enabling persons to meet challenges in the workplace as well as participate in shaping their work environments and society through social and environmental responsibility.

The triad of competences mentioned above — technical, self, and social competence — has a long tradition in Germany (ROTH, 1971), and predates the areas of learning concept as a central tenet of VET. Within the areas of learning concept, the triad of competences is reframed as an overall "competence to act"; part of VET's aim is to impart vocational competence to act and extend general education (KMK KULTUSMINISTERKONFERENZ, 2011). The three dimensions of competence to act are defined as follows (BADER; MÜLLER, 2002):

- **Technical competence:** The ability and readiness to handle tasks independently (planning, implementation, and monitoring in particular) and correctly, and to assess outcomes. This competence also involves extra functional skills such as logical, analytical, abstract, and integrated reasoning as well as the ability to recognise interconnected systems and processes.
- **Self-competence:** The ability and readiness to clarify, reflect on, and assess for one's self the developmental opportunities, requirements, and restrictions of work, family, and public life; to develop one's own talents, and to conceive and pursue one's own life plans. This also entails, among other things, developing well-thought-out moral values and a self-determined commitment to specific values.
- **Social competence:** The ability and readiness to comprehend social relationships and interests, affection, and tension, as well as to communicate with other people rationally and responsibly. This competence also involves the development of social responsibility and solidarity.

On one hand, these dimensions are dependent and interconnected, and cannot be developed independently of one another. On the other hand, these dimensions provide reference points and can be considered separately in order to evaluate whether all three dimensions are sufficiently represented.

The above-listed dimensions are accentuated with three transverse types of competence—communicative competence, methodological competence and learning competence —, which are not independent dimensions, but emphases within the technical, self-, and social competences. The three transverse competences are defined as follows (BADER; MÜLLER, 2002):

- **Communicative competence:** the ability and readiness to share issues and feelings with other persons via verbal (spoken or written) languages, and through nonverbal means (e.g., gesticulation and facial expression). This competence also encompasses the ability to perceive, understand and express one's own and others' intentions and needs, and is important in understanding and shaping communicative situations.
- **Methodological competence:** the ability and readiness to determine plans and targets when handling vocational tasks and problems (e.g., outlining steps in a process). Persons with this competence independently select, apply and develop

thinking methods, procedures and solution strategies. Methodical work includes independent design and assessment, which require initiative and creativity.

- **Learning competence:** the ability and readiness to comprehend, evaluate, and integrate into thought processes information regarding specific issues and relationships, independently as well as alongside others. In terms of professional work, learning competence develops through the mental processing of technical illustrations (e.g., sketches, wiring diagrams, professional articles), as well as in the comprehension and interpretation of social relationships and actions found in media (newspaper reports, magazine articles, films, etc.). Importantly, learning competence also involves the ability and readiness to develop, and use in further development, learning techniques and strategies within and going beyond one's vocational area.

This comprehensive concept of competence forms the basis for the dual VET system's turn toward work-centered models, as well as for the following teaching and learning reform research.

1.3 Reforming teaching and learning

In response to aforementioned critiques from industry representatives regarding the inadequacy of VET school environments, the areas of learning concept (German: *Lernfeld-Konzept*) was introduced in 1996 as a structural principle for framework curricula in VET Schools (not in general education). The reform had wide-ranging consequences not only for course and lesson design, but also for organisational conditions of schools, cooperation between schools and companies, and required qualifications for teachers. The traditional dichotomy — where school-based learning is all about theory and work-based learning is all about practical experience — is deemphasised in this approach through the reorientation of school-based content to match practical requirements for vocational and professional work.

Methodical work includes independent design and assessment, which require initiative and creativity

The reform did away with the concept of 'subjects' in vocational school environments and replaced it with that of 'areas of learning'. Vocational areas of learning are complex teaching-learning arrangements that require vocational actions, promote reflection, and facilitate the accrual of applicable know-how, acting as didactic equivalents of professional vocational activity. They are made up of complex tasks that are handled pedagogically using action-oriented learning situations that couch subjects of study in concrete terms. A team of teachers develops learning situations in educational conferences. The arrangements are work-oriented but didactically realised in the classroom and are accompanied by didactic reflection relevant to the vocation as well as individual and social life (GESSLER; HOWE, 2015).

1.4 Problem statement

After the reform, the first stage of curriculum development concentrated on adapting existing curriculum content to the areas of learning paradigm, transforming textbook lessons into learning situations. The federal state government supported this Germany-wide effort through project funding. This first stage lasted approximately until 2005. The second stage, after 2005, concentrated more on the development of new content and areas of learning in view of the overall goal: to foster the development of competence to act. In 2005, the education minister of the state of Bremen (the smallest state in Germany) initiated this second stage with a major reform: a certain amount of teaching and learning time in VET was compulsorily reserved for project-based learning. The reform started in a VET school in Bremen called "*Fachoberschule*". Upon the beginning of the school year in fall 2005, all teachers in Bremen in this school type were obliged to set up project-based learning environments.

2. State of the art

This section briefly elaborates the state of the art with reference to the time span at the beginning of the German's plan for the implementation of project-based learning in 2005.

Gudjons (1986) formulates ten programmatic characteristics of project-based learning: (1) life-world orientation, (2) orientation towards the interests of the participants, (3) self-organization and self-responsibility, (4) societal practice relevance, (5) purposeful project planning, (6) product orientation, (7) inclusion of many senses, (8) social learning, (9) interdisciplinarity, and (10) reference to the course. How these principles can be implemented on a daily basis and structured in classroom teaching was not answered. Similarly, further reports proclaimed general principles without formulating related didactical guidelines and concrete practical instructions for teachers and students (e.g., BASTIAN et al., 1997; HÄNSEL, 1999). The idea of project-based learning exists already since the 16th century and was first applied in architectural schools in Europe (KNOLL, 1993). Nevertheless, the concrete implementation in classroom teaching was for still unclear.

The few empirical studies paint a rather critical picture of project-based learning. Zimmer (1987) documents a variety of "forms of resistance" by teachers against project-based education; these range from a rejection of collective forms of work to a lack of insight into the need for well-planned procedures. Günther (1996) comes to a rather critical judgment of project-based learning on the basis of almost 300 interviews with students in numerous schools: only one in three students, he reports, identifies as a "project-oriented" type. Another third of students considered themselves "project-distant", and the remaining third was undecided. Schümer (1996) concludes that the conditions of institutions (e.g. timetables, performance evaluations, and the subject-teacher principle) discourage the use of project-

based learning. These findings suggest that attitudes and behaviours differ among teachers, and that teachers who practice project-based education tend to be more cooperative and satisfied with their jobs. Studies by Pätzold et al. (2003) and Seifried (2006) have shown that project-based learning in VET is marginal in Germany, with less than 5% of teaching hours invested in project-based learning. Teachers gave various reasons for not employing project teaching in their lessons. In particular, they indicated a lack of project didactics and teaching materials, and noted that framework conditions (e.g., time limits on lessons) would make the use of a project-based model difficult, if not impossible. Petri (1991) found similar results. Although teachers (here: in Austria) appreciate the advantages of project-based teaching given its promotion of autonomy, social learning, motivation, and the broadening of perspective, they "capitulate" to the difficulties: high expenditure of time, problems planning jointly with students, obstacles to cooperation, difficulties arising from disagreements with institutional policy or procedures, lack of understanding of the college.

Teachers who practice project-based education tend to be more cooperative and satisfied with their jobs

In conclusion, schools, teachers, and students were in 2005 not prepared for the implementation of project-based learning (PBL) in VET schools, nor made sufficiently aware of how to set up projects, how to teach with projects, or how to learn in a project environment.

3. The project-based learning approach

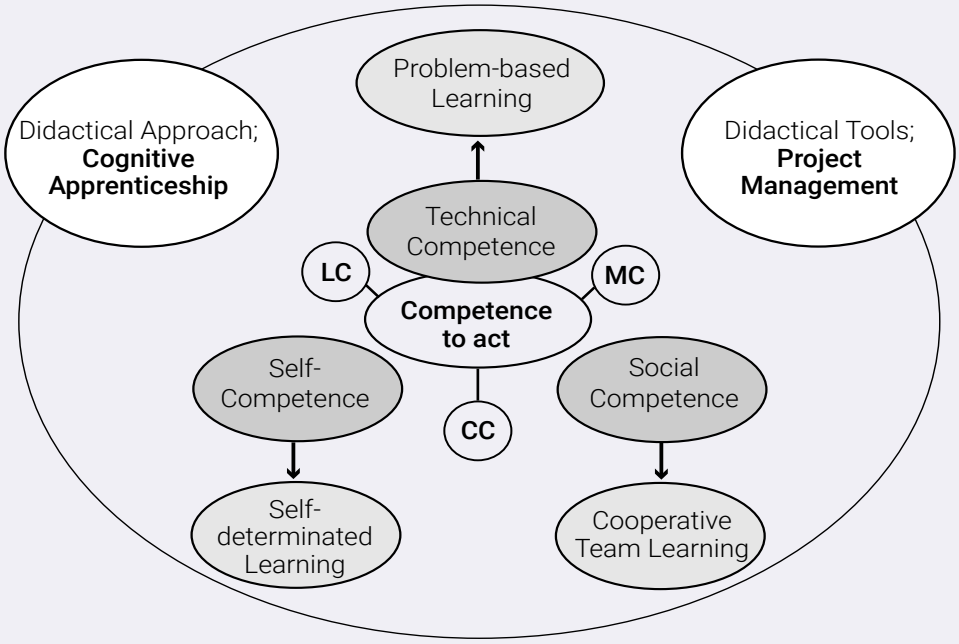
In light of the vacuum caused by lack of school and teacher readiness and of clear didactical approaches, as well as by wide pedagogical expectations (e.g., self-responsibility and social learning), the state institute for schools of Bremen commissioned one of the authors, Michael Gessler, to support the implementation of compulsory project-based learning in selected VET schools in Bremen.

The assignment was given five months before the summer school holidays, with the goal that after the break, teachers should be capable of offering project-based learning. The group[1] spent three months developing a didactical approach to teaching, as well as creating learning materials for teachers and students, followed by two months of teacher training[2]. After the summer school break, the group invited all involved school classes, students, and teachers to the University of Bremen for one week for the initial phase of project-based learning implementation. There were four reasons for holding the first project-based learning experiences at the University: first, this allowed offering support immediately in case of problems. Second, the novel surroundings helped students and teachers break through routines and habits carried over from the traditional school environment. Third, the presence of all involved students and teachers facilitated social control as well as social engagement. Fourth, locating the trials on-premises made it convenient to observe practices and collect data.

3.1 Learning approaches

The foundations of the model are the aforementioned three competences comprising competence to act (technical, self-, and social) and the three cross-dimensional competences (communicative, methodological, and learning). These dimensions are correlated with three learning and motivation approaches, which are problem-based learning, cooperative team learning, and self-determined learning. They are framed and integrated through the didactical approach of "cognitive apprenticeship" on one hand and the tools of "project management" on the other hand (Figure 1).

Figure 1 - Theoretical framework



CC = communicative competence; MC = methodological competence; LC = learning competence

Source: Own depiction.

This section will describe these learning approaches, and in the next section, the framing.

3.1.1 Problem-based learning

Problem-based learning goes back to the McMaster model outlined by Barrows (1986), originally developed for medical education. In addition to motivating the learner, problem-based learning should lead to the development of applicable knowledge while promoting self-control, problem-solving, and social skills.

The implementation of different emphases, especially in Anglo-Saxon countries, is based on basic principles: The core idea of problem-based approaches is — as the name implies — that complex and realistic, not well-defined, problems are the starting point of learning. The assumption here is that high realism and authenticity in lessons trigger active-constructive and self-directed learning processes lead to applicable knowledge (LAVE; WENGER, 1991).

High realism and authenticity in lessons trigger active-constructive and self-directed learning processes lead to applicable knowledge

Based on the view that active knowledge building presupposes a well-ordered knowledge base whose structure requires guidance and support, instructional elements are also provided in these approaches. The central principle is the self-responsibility of learners in terms of, among other things, their knowledge gaps and their levels of commitment. The dominant organizational form is small-group learning, in which the self-directed and discursive phases alternate according to the experiences and needs of learners. Learning groups are guided and supported by a tutor in order to develop necessary competences, such as problem-solving or cooperation. In an ideal problem-based learning environment, students work on several problems at once in coordination (BARROWS, 1986; REINMANN; MANDL, 2006; SAVERY, 2006; ZUMBACH, 2003).

Commonplace workplace problems are central components of problem-based learning, but as Dörner et al. (1983, p. 302) describe, a problem signifies that "the means to reach a goal are unknown or the known means can be combined in new ways, but also that there are no clear ideas about the intended goal". Problems are characterised by complexity. Dörner (1976, 1986, 1992) classifies complexity in problems using the dimensions 'dynamics', 'interconnectedness', and 'lack of transparency'. Dynamics is the extent to which a problem and its parts are not statically related to each other but moving together or against each other, so that factors like origin and development must be taken into account (DÖRNER et al., 1983). Interconnectedness means the extent to which the presumed variables of the system influence each other and defy measurement in isolation. Lack of transparency indicates that most assumed real-world variables are only partially known in problem-solving processes. An intervention in a complex system leads to side effects that are only foreseeable in a very long time.

According to Pólya (1964), problem-solving processes can be subdivided into four phases: (1) understanding the problem, (2) developing a plan, (3) executing the plan, and (4) reviewing. In each of these phases, different heurisms (i.e., heuristic aids, strategies, and principles) are applicable. Pólya (1981) characterizes heurisms as learnable guides that may help during the problem-solving process, such as questions to consider when approaching a given type of problem. He divides the problem-solving process into four phases, assigning several questions to each:

Understanding the problem

- What is given?

- What is unknown?
- What is the condition?

Developing a plan

- Is this a known problem?
- Are there known related problems?
- Are there known helpful strategies?
- Can the problem be reworded?

Executing the plan

- Can the steps be controlled?
- Is the correctness of each step clearly identifiable?
- Is proof of the correctness of the step possible?

Reviewing

- Is the result controllable?
- Is the result also achievable by other means?
- Is the result also applicable to other problems?

Heurisms seek to facilitate problem-solving by offering a framework for reasoned approaches to (PÓLYA, 1964).

3.1.2 Cooperative team learning

Tuckman and Jensen (1977) developed a phase model for the development of basic group structures that has remained current, in which groups whose members have no prior familiarity with each other undergo the following development phases: 'forming', 'storming', 'norming', 'performing', and 'adjourning'. This phase model illustrates an ideal developmental logic for groups, outlines a plausible process of group formation and evolution, and conclusively explains observed changes over time in groups.

The first phase, forming, is characterized by participants' uncertainty because they do not know each other, what to expect, or what is expected of them. Overall, positive socio-emotional behaviour predominates, with interactions polite but distant. In the course of this phase, group members get to know each other.

The next phase, storming, focuses on the development of the group structure. Leadership, influence, and role structures emerge; this process can be accompanied by disagreements and conflicts, so negative socio-emotional behaviour is more frequent during this phase.

As role structures evolve in the norming phase, group members develop a shared understanding of the group's goals and a system of norms that serves to guide the group's interactions. The interaction framework is increasingly characterized by close relationships among group members, which is reflected overall in predominantly positive socio-emotional and task-related behaviours.

In the performing phase, interaction patterns are task-oriented and aimed at achieving established group goals, while the final stage, adjourning, is defined, depending on the group's track record and results, by a sense of achievement or disappointment (TUCKMAN; JENSEN, 1977).

In the norming phase and even in the run-up to it, groups — partly tacitly and partly consciously — develop expectations of individual group members regarding typical tasks and situations. These are reflected in a more or less coherent system of rules of conduct, which in this context are referred to as group norms. Group norms usually evolve in the early stages of a group but may evolve over time, perhaps because of adaptation to a changed environment or new group composition. Depending on their degree of maturity, they also reflect a general understanding among the group of members' individual goals, tasks, and roles. In a favourable case, group norms also entail knowledge of each member's expertise and special skills; a similar understanding of what the group should do, and who should do what, is a good condition for communication, coordination and cooperation (MOHAMMED; DUMVILLE, 2001; NIJSTAD; VAN KNIPPENBERG, 2007).

These characteristics of cooperative team learning have to be considered in the didactical approach. Finally, Johnson and Johnson (1994) define five key elements of effective cooperative learning: (1) individual accountability, (2) positive interdependence, (3) face-to-face interaction, (4) collaborative skills, and (5) processing and reflecting. In the didactical approach of the project, these factors were strongly considered; if the goal is to engender the three competences in VET, then success can only be reached if all objectives are reached. For example, if the team solved a technical problem, but the team process was ineffectual and one or more individuals feel insecure rather than empowered, the whole approach has failed.

3.1.3 Self-determined learning

Motivation is often just subdivided into intrinsic and extrinsic motivation. In contrast, Deci and Ryan (1993) distinguish multiple forms of motivation based on intent. Intentional and therefore motivated actions are directed either toward achieving an immediately satisfying, interesting, or exciting experience or toward a longer-term goal. Behaviours that do not pursue a recognizable goal are called "amotivated".

Motivational energy can be classed three ways in terms of the needs that drive it: (1) motivational energy driven by physiological needs, (2) that driven by emotional needs, and (3) that driven by psychological needs. For Deci and Ryan (1993), in particular, there are three key psychological needs that they call "basic human needs," as they are proven, indispensable, and innate prerequisites for human well-being: (1) the need for self-determination and autonomy, (2) that for experience of competence and effectiveness, and (3) that for social involvement.

- **Self-determination and autonomy:** The need to experience one's self as the starting point of one's actions and decisions. Krapp and Ryan (2002) define autonomy not as "independence" or "unlimited freedom", but rather, as a fit between tasks required in the current situation and the perception of a person (importance of the task, willingness).
- **Experience of competence and effectiveness:** The need to be able to make a difference and be able to meet chosen and set requirements (i.e., be competent); and the need to experience that one is not at the mercy of one's environment, but can control events through actions (i.e., be effective).
- **Social involvement:** The need to feel connected to other people in a social environment, to be effective in this environment, and to experience one's self in a personal and autonomous way (DECI; RYAN, 1993). People want to be accepted and recognized by persons who are important to them (KRAPP; RYAN, 2002).

When motivated actions are the result of a free choice and correspond to the wishes and goals of the individual self, they are self-determined or autonomous. However, if they are forced and incongruent with individual wants and needs, they are considered controlled. Self-determined and controlled behaviour thus define the endpoints of a continuum that determines the quality or orientation of a motivated action. This continuum is subdivided into five types of motivated action. Four types are extrinsically oriented, with goals a result of external factors: (1) external, (2) introjected, (3) identified, and (4) integrated; while (5) intrinsic implies no external impetus for goals — in other words, the execution of the action constitutes the goal (DECI; RYAN, 1993). Deci and Flaste suggest that individuals pursue goals and realize actions because it is in their nature to take on tasks and actively satisfy their innate needs. They are who, because they are forced to, but because of their nature to (DECI; FLASTE, 1995).

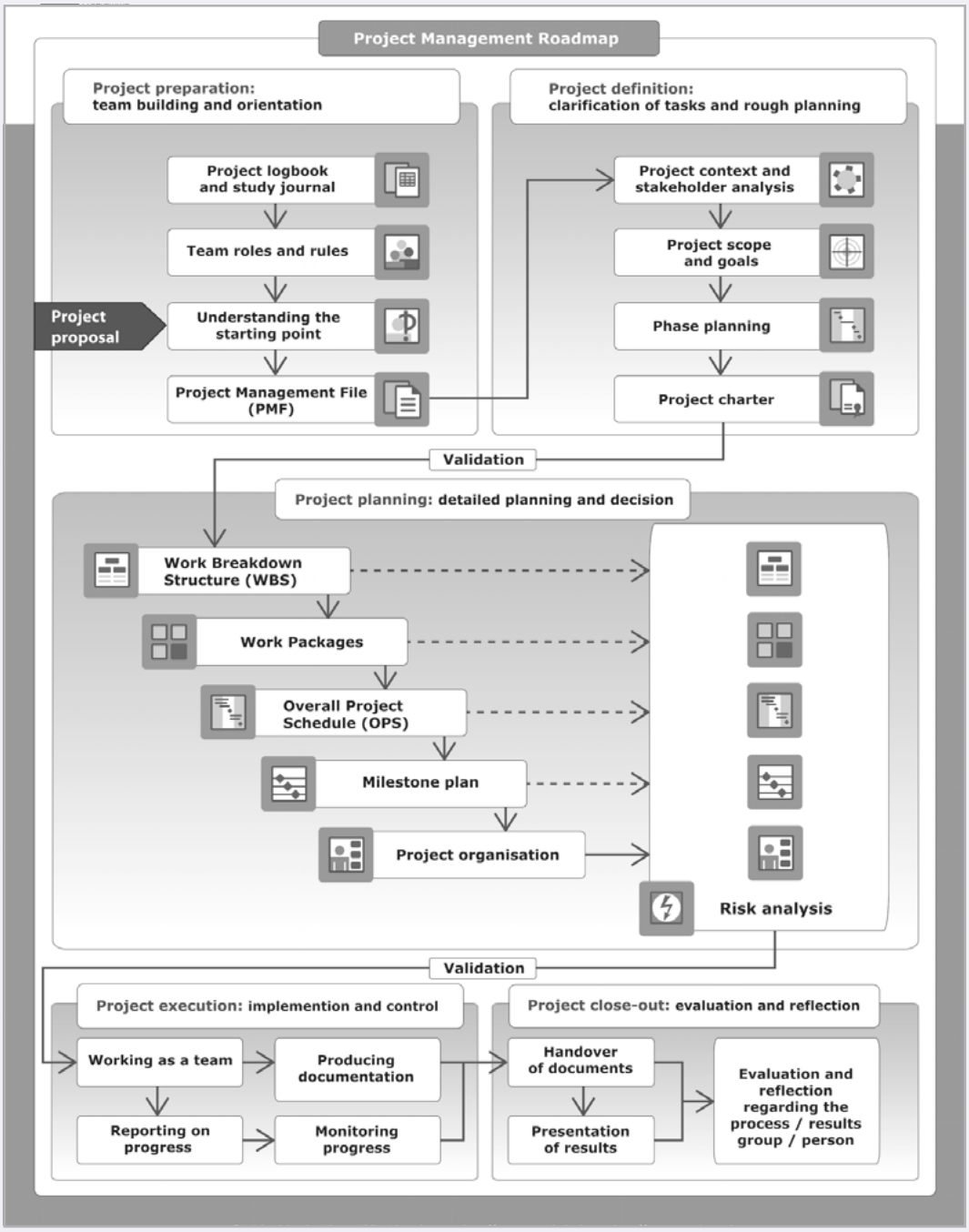
3.2 Framing and integration

This section will now describe approaches to framing and integration: project management on the one hand and cognitive apprenticeship on the other hand.

3.2.1 The project management approach

This research used project management (GESSLER, 2009, 2016) as a resource in two ways: by structuring project-based learning based on project management methodology, and conversely by basing project management methodology on the experience of doing projects. This approach was immediately accepted, and indeed strongly supported, at VET schools. Figure 2 shows the road map (educational guide for project-based teaching and learning).

Figure 2 - Road map



Source: Gessler & Uhlig-Schoenian (2005, 2017).

The guides developed to support project-based teaching and learning (GESSLER & UHLIG-SCHOENIAN, 2017; UHLIG-SCHOENIAN; GESSLER, 2016) mutated step by step into a dogma, at least in the sense that the users (teacher trainers, teachers, and students) believe that this procedure is the only truth. However, the purpose of project-based learning is about solving problems. If variations in tools or process (Figure 2) are necessary to achieve results, they should be encouraged. Each step in the road map includes 'micro-steps', described in the next section.

3.2.2 The cognitive apprenticeship approach

The research identified seven methods, which have been dubbed as 'micro-steps', for the design of project-based learning environments according to the principles of cognitive apprenticeship.

1. **Modelling of excellence:** As the first micro-step, a teaching expert introduces a project management method to solve a concrete problem. For this purpose, the expert externalizes and explains invisible and implicit processes, like heuristic and control strategies. The goal is to build a mental model for students that includes the facts, processes, and steps necessary to solve the problem.
2. **Coaching:** During the next step, learners themselves apply the methodology outlined by the expert in small groups. While doing this, they are monitored and coached by the expert, who offers assistance, suggestions, and responses, and draws the learner's attention to aspects of the problem or ways of proceeding which have not yet been perceived.
3. **Scaffolding:** As knowledge increases, the relationship between learner and expert becomes more cooperative, with learners handling as much work within a project as is appropriate to their knowledge. In case of difficulties, the expert offers individual assistance.
4. **Fading:** The expert gradually reduces his or her assistance until learners are able to solve a given problem completely independently.
5. **Articulation/presentation:** Learners are encouraged to structure and articulate their knowledge by a variety of means, such as question-and-answer games or role-swaps between expert and learner. This kind of articulation offers the opportunity for learners to speak about their acquired knowledge in cooperative activities. In this research, groups gave presentations on solutions to each problem, with time allowed for discussion and comparison of various solutions.
6. **Reflection:** Learners are urged to compare their own problem-solving processes to those of colleagues or experts. Video or audio recording is useful for purposes of reflection, as it allows for review and comparison of problem-solving processes after the fact.
7. **Exploration:** The expert supports learners by encouraging interest in a problem, defining the problem field, and proposing problems with different levels of

difficulty. As in the case of 'scaffolding', assistance in discovery is reduced in response to increasingly independent explorative behaviour, until learners are independently able to define, determine, and systematically solve problems.

Before the first step — understanding the starting point — can be achieved, three prearrangements are necessary (see figure 2): first, a system of project logbooks and study journals should be introduced; study journals stimulate reflection and the development of metacognitive knowledge, and project logbooks are useful in assessing accomplished work and assisting teachers in evaluation of the process. Second, the establishment of team roles and rules must be stimulated in a prescribed way; when they are not, roles develop in unintended, uncontrolled, and often dysfunctional ways. Third, the initial problem to be solved in a given project should be presented in detail at the onset of the project. Problems should be explained to a degree based on students' prior experience in the field, and parameters such as environmental conditions, causes, and technical tools may be outlined; alternatively, in the interest of difficulty, this presentation could detail only the project goal.

To guide the as-yet inexperienced and somewhat uncertain teachers through the process, the project developed a step-by-step guide which was updated in the following years, most recently in 2016.

3.3 Crossing the borders

With funding from the German Association for Project Management, the project transferred and implemented its approach all over Germany in different VET programmes. Also, defined a core curriculum for areas of learning. In 2007 started to implement the approach also in pre-vocational education (GESSLER; KÜHN, 2014) and developed for this purpose a comic (UHLIG-SCHOENIAN; GESSLER, 2007, 2016). With funding from the European Commission, adapted the approach in numerous European countries, including Poland, the Czech Republic, Hungary, Turkey, France, Italy, Spain and Portugal. Recently, have been working on extensions to strengthen the development of entrepreneurial competence (GESSLER; SEBE-OPFERMANN, 2014).

4. Results

Since the first implementation improved the materials and teacher training and built up a group of representatives in the schools and trainers for the teacher trainings. However, this section documents early post-implementation results from two perspectives: students and teachers. The data collection of the perception of the students took place in autumn 2009 at the beginning of the school year in the observed classes at the same time (SEBE-OPFERMANN, 2013). The data collection of the perception of the teachers took place between 2008 and 2010, before the teacher training (t_1) and after the finalisation of the project-based learning unit in the school (t_2).

4.1 Perception of students

This section describes the results for the central dimensions of the model: the perceptions of students on their self-determined learning, social team learning, and problem-solving.

4.1.1 Self-determined learning

The mean values indicate that participants perceived healthy levels of autonomy, competence experience, and social involvement

For this investigation, 142 students from six classes attended the study, forming 33 learning teams. The researchers evaluated complete data sets for 103 participants, amounting to a response rate of 73%. The average age in the sample at the time of the study was 20.4 years (SD = 2.6).

Based on the self-determination theory of motivation of Deci and Ryan (1993), the study used an already existing scale (1 = very low to 4 = very high) to tabulate motivation types among participants (PRENZEL, 1994; PRENZEL, 1996; PRENZEL et al. 1996). Among learners, the motivation types amotivation (x = 1.55, SD = 0.49) and extrinsic motivation (x = 1.83, SD = 0.57) showed values well below the theoretical mean (scale: 1 = very low to 4 = very high). On the other hand, the motivation types introjected, identified, and intrinsic all showed values above the theoretical mean of the scale (x = 3.01–3.46). The low standard deviation (SD = 0.52–0.63) indicates that the vast majority of respondents reported similar motivations to each other. The overall motivation scale shows a high level on average (x = 3.24, SD = 0.43) and suggests a high rating of participants' own motivation. Reliability of the scale can be described as acceptable, with C_{α} = 0.70.

According to the self-determination theory of motivation (DECI; RYAN, 1993), perceived features of learning environments such as support for autonomy, competent action, and social involvement in learning are conducive to the development of self-determined motivations. These three motivational conditions were also measured using the Prenzel survey tool. Participants were asked the extent to which their learning environment offers options, freedom, and support for independent action; the extent to which they receive recognition for or feedback on their performance; and the extent to which interaction during class is collegial and supportive. These three survey aspects have been combined into aggregates. The mean values indicate that participants perceived healthy levels of autonomy, competence experience, and social involvement (x = 2.99-3.44). The standard deviation makes it clear that these features were perceived very similarly on average. The reliabilities of the aggregates (C_{α} = 0.74-0.85) have sufficient-to-mediocre dimensions. The values of the overall scale for motivational conditions, which are composed of the three aggregates mentioned above, illustrate that learners experienced motivational conditions in the classroom (x = 3.18). The standard deviation (SD = 0.48) of the total scale indicates that these conditions were largely felt to be similar. The scale has an acceptable reliability (C_{α} = 0.75).

4.1.2 Cooperative team learning

The individual cooperative action was assessed based on a self-developed scale (scale: 1 = very low to 4 = very high) reflecting the perception of one's own participation in cooperative actions in general (one item) and in various aspects of one's involvement (three items). The item statistics indicate that learners overwhelmingly rated both their participation (x = 3.6) and their involvement (x = 3.42-3.57) highly. The standard deviation (s = 0.60-0.76) illustrates that these estimates are relatively similar among learners. The resulting total scale has a mean value of x = 3.51 (SD = 0.51) and an acceptable reliability (C_α = 0.76).

The question of cooperation in groups was raised in the form of another self-developed scale (scale: 1 = very low to 4 = very high), with cooperation operationalized on the basis of four items: (1) the general quality of cooperation in the group (one item), (2) the perceived level of cooperative support from the group (one item), (3) the degree to which group tasks in the group were responsibly performed (one item), and (4) the extent to which a goal was commonly and sustainably pursued (one item). The statistics make clear that all cooperation-related items were predominantly rated favourably (x = 3.23-3.63). The standard deviation (SD = 0.61-0.85) shows that estimates differed only slightly. The scale indicates that cooperation in the group was healthy (x = 3.47, SD = 0.63). The scale has a good reliability (C_α = 0.85).

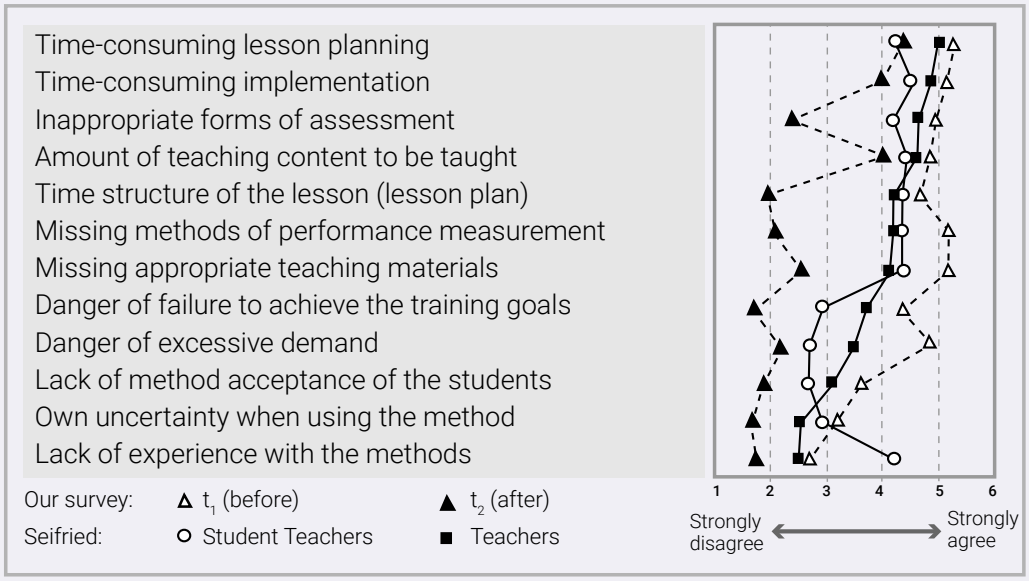
4.1.3 Problem-solving learning

Structure of problems plays an important role in cooperation in projects. The self-developed scale (scale: 1 = very low to 4 = very high) for problem-solving learning reflects the subjectively perceived need to work together to solve a problem (one item), the perceived importance of role-dependent sub-tasks in relation to the overall outcome (one item), and the perceived opportunity for each group member to participate in problem-solving (one item). The resulting overall scale for problem structure shows moderately high values (x = 3.3, SD = 0.59) above the theoretical average (x_{theo} = 2.5) and a good reliability (C_α = 0.86).

4.2 Perception of teachers

On average, four months elapsed between the two data collecting points (t_1: N = 286, t_2: N = 248). The survey items used were the same as in a study conducted by Seifried (2006). Seifried did not conduct surveys at two different time points; rather, he gave the survey to different cohorts: student teachers (N=214; still at the university) and teachers (N=222; already in practice). The Figure 3 shows the resulting data from both surveys.

Figure 3 - Effect of practice on teacher perceptions



Source: Own Depiction.

In this survey, barriers to implementing project-based learning were perceived differently before the teacher training (t_1) and after the implementation in the classroom (t_2). Planning and implementation was still perceived as time-consuming and the amount of teaching content as problematic, but other barriers became obsolete (e.g., inappropriate forms of assessment, time structure, lack of performance measurement methods). All differences are statistically significant ($p < .05$).

Seifried's data showed the cohorts, student teachers and teachers, as perceiving many aspects similarly; just one aspect was very different rated: the lack of experience with the methods. Overall, the respondents were before more critical and pessimistic as the Seifried cohort, placing greater weight on barriers. After experiencing project-based learning, the cohort has been less critical. Therefore, it is possible to assume that the teacher data of the Seifried cohort are biased: The teachers had in fact little experience with the methods, even though they did not communicate this lack of experience.

5. Final considerations

Project-based learning is, on one hand, a valuable approach to enriching classroom teaching; on the other hand, many obstacles stand in the way of its success. The project-based model is advantageous in its promotion of problem-solving, social, and self-determination competences. All these competences are in demand in the labour market, and it is therefore right and correct to intensify engagement in implementing project-based learning in VET schools.

Despite this, implementation will not be without difficulties: a didactical approach to teacher training, along with supporting materials, is necessary. In addition, extra time, space and specialised resources must be allocated; teachers require training in advance and peer support during implementation (this study suggests teams of two teachers for the initial trials); and assessments have to be changed according to the project-based learning method and the competence developed (social competence should also be recognized).

Multiple-choice tests or simple exams based on only the reproduction of knowledge are insufficient in project-based learning. Exams should focus on understanding, experience, and the demonstration of competence within the process as well in relation to the developed product or service. The focus of project-based education should not be to replace other forms of learning but to increase the variety of teaching and learning methods available and to integrate project-based methods with traditional teaching.

Notes

[1] Gessler & Uhlig-Schoenian (2005, 2017). The development group was a mixed group with representatives from VET schools, one representative from the state institute for schools (Jürgen Uhlig-Schoenian), and one representatives from the University of Bremen (Michael Gessler).

[2] The teacher training was conducted by the authors, the representative from the state institute for schools, and one independent trainer.

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INTERVIEW

SENAC AND CINTERFOR: AN IMPORTANT PARTNERSHIP

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In 2018, Senac National Department, in the constant road to modernization of its professional education policies, established an important partnership with the Inter-American Center for Knowledge Development in Vocational Training (Cinterfor), a body of the International Labor Organization (ILO), based in Montevideo, Uruguay.

Cinterfor/ILO is responsible for coordinating a network of public and private entities and institutions, composed of more than 65 organizations in 27 countries in Latin America, Caribbean, Spain and Africa. During more than its 50 years of activities, it has been devoting itself to the consolidation of labor competences and knowledge dissemination in the labor education field.

The publication of the *Senac Journal of Education and Work* special edition is the initial result from this partnership, which also anticipates an extensive research on skills development practices to the 21st Century, identified by Senac as "Formative Marks".

In the following interview, Fernando Vargas and Anna Beatriz Waehneldt talk about two instances when the institutions were together in 2017: Senac Regional Directors Annual Meeting in Campos do Jordão, São Paulo; and the Seminar Vocational Training Methodologies Based on Projects, Challenges and Opportunities, promoted by Cinterfor/ILO in Montevideo, having the latter even motivated the production of this special BTS edition.

FV– During Senac's Regional Directors meeting, in the beginning of 2017, Cinterfor introduced ten guidelines to the marketing and consolidation of labor and life skills education systems in Latin America and the Caribbean[1]. What has Senac developed towards it?

ABW– We understand - and endorse - that the ten guidelines aim at the building of solid life skills and labor training systems and we have been working extensively towards this direction. In 2018, we began communicating with Regional Departments about the emphasis in technical high school education offers, designed to contribute to the improvement of such basic schooling stage, historically recognized in Brazil by its low learning indexes and high rates of desertion and evasion. Senac's higher education is also leaning towards expansion, offering both on-site and online classes. The Sectorial Forums by Segment, a market listening strategy that we have adopted since 2013, alongside our surveys on: Perceived Quality, Egresses, Current and Future Demand, and research investigation on teaching practices, such as those of the Integrative Project, carried out in 2017, are further examples of actions that directly connect with Cinterfor/ILO guidelines.

Notably in regards to the responsibility of vocational education systems in the ninth guideline - "promoting equal opportunities and social inclusion" – Gratuity Senac Program (PSG) stands out as the driving force behind its social function, by imposing a charge of 66.6% from the mandatory fee to subsidize vocational education access to the low-income population. The continuous search for efficacy and effective impact of the PSG in the reduction of Brazilian social inequalities is a central goal we have been pursuing. The demand to promote the agreement with productive development policies and technological changes guide these actions and, above all, they are a way to promote lifelong learning and coordination between formal education and vocational training, essential guidelines from Cinterfor to Latin America.

FV– At the seminar in Montevideo, in November 2017, we discussed, with the representatives of several vocational education institutions in Latin America, the perspective of Project Based Learning (PBL) as a strategy for skills development within the labor training scope. From your point-of-view, what is the demand for vocational education institutions to take up the proposal of active teaching and learning methodologies, and, particularly, the PBL, as an institutional policy for vocational training?

ABW– The new paradigms of the industry 4.0, the intense dynamics of disappearing or generating occupations, the increasing risk of social inequality in Latin America and the market demand for socio-emotional competent professionals, in addition to the techniques integral to the career profile, are factors that have urged the vocational education institutions to review their course of study. In our discussions during the seminar, we have observed how the Latin American institutions, Senac itself among them, are committed to incorporate to their own educational practices strategies that will allow a vocational training education to be aligned with the market and with enough socio-emotional development capabilities and vocational skills. We believe that both these aspects possess relevant social impact force, since they are directly associated with the employability of our students, to their entry into the professional world as well as to their stability and professional growth.

In this regard, the active learning methodologies, especially the PBL, have been proving, as Cinterfor itself has pointed out, to be a promising path to streamline courses of study and update teaching and learning practices within vocational educational institutions. It is assumed that, in seeking solutions to challenges and problematical situations that are associated with the reality of the occupation in which the student is being trained for, the methodology for projects provides collaborative and participative construction experiences, which allows the student to take responsibilities in joint efforts, promoting their improving role and coordinating socio-emotional skills and abilities. As a result, learning is achieved through the experience provided during the project development; an individual learns by problematizing, researching, testing hypotheses, making decisions and working as a team to accomplish the objectives. The experience with projects in the educational field, even if it is not an innovation in itself, is a pedagogical alternative required to vocational education institutions, above all, by their ability to focus on the dialogic relationship and collective learning throughout the course, justifying, then, their required inclusion in the formal curriculum construction of vocational education courses. Senac is one of the institutions that carry out this prerogative and has been investing significantly in the consolidation and improvement of practices founded on projects-based learning.

FV– In addition to these contextual factors, what took Senac to turn the pedagogical experience of the Integrating Projects into a mandatory Curriculum Unit in the courses it offers? What kind of advantages has this brought about? What are the challenges of this strategy?

ABW– In 2013, Senac introduced its Pedagogical Model, an important nationwide line of action. The main motivation for the Model implementation was the demand to offer Learning, Professional Qualification and Intermediate Level Technical Qualification courses, with the same pedagogical quality and operational perspective throughout the country. The model innovated as it consolidates guidelines to the educational practice and points to the common horizon we pursue regarding vocational education quality.

To this respect, the experience with projects, based on the studies of specialists from the Regional Departments who worked on the formulation of the Model original principles, was appointed as a power force to the necessary consolidation of competencies and the development of Senac's Formative Marks, which differentiate the professional we graduate. Through the Pedagogical Model, the methodology of learning by projects was therefore incorporated into the curricular construction of those courses, entitled Curricular Unit of Differentiated Nature Integrative Project (UCPI).

Since then, we have been following the implementation of this experience nationwide and, at this point, it is worth noting that presently the Senac Pedagogical Model has reached more than 70% of the courses offered in 92 vocational education titles, which are carried out cooperatively. This means that more than 280.000 students of these courses participate in Integrative Projects all over the country. If we consider the pedagogical potential of the projects in coordinating skills and the synergy of teachers and students working on experiences that, as we have seen, extrapolate Senac's own environments, the great advantage of this strategy has been, in fact, to increase the quality of our professional training. However, given the diversity of our country, the originality of this experience and the multitude of projects, taking into account the different features of each offer type, our biggest challenges are, on one hand, ensuring that the more than the 25.000 teachers in our institutions have enough training in respect to the positive development of Integrative Projects and, on the other hand, collecting evidence confirming the effective impact of this experience, in order to, in the institutional management field, correct routes, expand and disseminate what is working. Some of these challenges collected in the research we conducted in 2017, with the more than 2000 Senac Integrated Project faculty teachers, were introduced in this special Journal edition. The availability of the *Collection of Technical Documents of the Pedagogical Model*[2] and, more recently, the launching of the Transparency and Unit Program courses are major investments that the National Department has been making towards the permanent training of teachers and technical teams.

FV– Senac has carried out a research with the teachers of Integrative Projects in 2017 and now, in 2018, in partnership with Cinterfor/ILO, is in the final phase of an even bigger research on teaching practices for the development of Formative Marks and Skills for the 21st Century. What is the relationship between these two actions?

ABW– The Integrative Projects research results, discussed during the Seminar in Montevideo - and introduced in this BTS edition - have made possible to understand several stage aspects of the Projects: Integrated Planning, Problematization, Execution, Evaluation and Synthesis. The teaching practices for the Development of Formative Marks[3], although they had been approached in this research, were expected for a new investigation round in 2018, in the series of activities for qualitative studying of the Pedagogical Model implementation. In addressing these issues, we perceive the empathy with the topic of social-emotional skills in vocational education, the so-called 4C's - Creativity, Communication, Collaboration and Critical Thinking -, and an important study topic of Cinterfor/ILO.

Later, in discussions following the Seminar, the Cinterfor/ILO stressed the pressing need for understanding how vocational education systems have faced skill development issues for the 21st century, especially in a time of great changes in the workforce world. This was the basis for establishing a productive exchange of knowledge and skills among institutions, seeking to understand how teachers implement pedagogical practices aimed at developing Formative Marks.

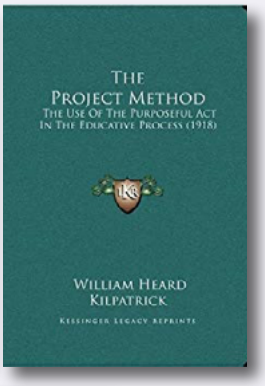
Throughout the months of July, August and September of this year, we conducted three web conferences of joint planning and Matrix building of Formative Marks/ Skills for the 21st Century, which was the foundation for the survey tools. Currently, we completed the data collection phase, with more than 3,000 participating teachers, and we expect that the results, to be released in the first half of 2019, will bring important benefits so that, together, Senac and other Latin American vocational education institutions will further enhance our educational efforts. This challenge is what moves us.

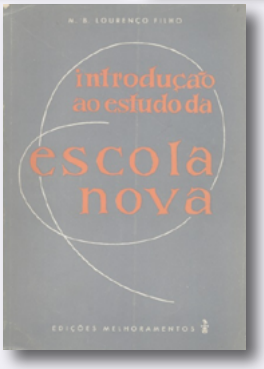
Notes

[1] To learn more about the Guidelines, check out *O futuro da formação profissional na América Latina e no Caribe*: *diagnósticos e diretrizes para seu fortalecimento*. Montevideo: Cinterfor/ILO, 2017. Available from https://www.oitcinterfor.org/sites/default/files/simplificacionista/futuro_FP_portugues_web.pdf

[2] Available from www.extranet.senac.br/modelopedagogicosenac/index.html

[3] To obtain more information about Senac Formative Marks, search *Concepções e princípios*, v. 1 from the Coleção de Documentos Técnicos do Modelo Pedagógico Senac. Rio de Janeiro: Senac National Department, 2015. Available from <http:www.extranet.senac.br/modelopedagogicosenac/arquivos/DT_1_Concepcoes%20e%20Principios.pdf>Viewed in 10/29/2018.





REVIEW OF THE WORKS

BENDER, W. **Aprendizagem baseada em projetos**. Porto Alegre: Penso, 2014.

KILPATRICK, W. **The project method**. Whitefish, MT: Kissinger Publ., 2010. Fac-símile do original de 1918.

LOURENÇO FILHO, M. B. **Introdução ao estudo da escola nova**. São Paulo: Melhoramentos, 1930.

Thinking in action: the project methodology

Dewey ordered chairs and tables for the activities of the experimental school founded by him in Chicago. The vendor replied, "You asked us for furniture for the children to work, what we have is furniture for them to listen" (BURKE; GROSVENOR, 2008, p. 69). This episode shows that learning by doing was a completely strange concept at the end of the 19th century. It also shows that from the beginning of his activities as an educator, Dewey associated action and thought. The idea of "children working" marks a methodological turn that would include, among its unfolding, project-based leaning.

Black Mountain College is a radical example of education, which moves away from the school-auditorium model; an institution that associated Dewey's ideas with educational proposals from the Bauhaus movement. There, there was no traditional academic education, everything was done around hands-on activities. Action preceded any and all intellectual production. Or rather, all intellectual production was born from action. In a passage in which he associates Black Mountain College with Dewey's ideas, Adamson (2007, p. 88) observes:

> As Dewey had argued in 1937, the teaching of craft knowledge cannot be put into words because it is the work of the artist/designer, and no one can teach them how to do it. If were possible to tell them what to do, their work would be mechanical, not creative, and nothing original.

Dewey proposed an education that did not separate doing from knowing. He always emphasized that learning happens in action. His ideas were largely based on a reading about education in the craft workshops of old corporations (ADAMSON,

2007). Reflections on learning to work led Dewey to propose a school education in which action played a central role. Project-based learning is tributary of this broader conception of education.

The central focus of this review is William Heard Kilpatrick's *The project method* (2010), a landmark in education, giving directions to what came to be known as project method. But the centuries-old history of this method has seen many developments. Therefore, before considering Kilpatrick's text, I thought appropriate to present other works: *Project-Based Learning* (BENDER, 2014), an example of a current work on the subject; and *Introduction to the Study of the New School* (LOURENÇO FILHO, 1930), to show how one of the pioneers of the New School in Brazil presents project-based learning.

Education for the 21st century

Bender (2014) presents his work as a proposal for 21st century education. It is not a modest proposal. He regards his book as a guide for an education that identifies with the demands of the new times.

The author integrates to his proposal methodological solutions used with varying degrees of success in education, instrumenting a model of project method that can include, among others, WebQuests and microlearning. Based on experiences developed in several schools, he elaborates a prescriptive framework with the following phases of development: anchor, driving question, tasks, access to information, and elaboration of artifacts. Anchor is a starting point, almost always imagined by the teacher, which seeks to relate students' interests to areas of knowledge or problems that may merit investigation; driving question is an inquiry, usually proposed by the students, that directs the investigative process; tasks are investigative phases involving students, individually or in groups; access to information is defined as a condition involving instruments and means; artifacts are products that offer concrete answers to the driving questions.

Bender argues that the project method is based on the interests of the students. For this reason, participants are often very motivated. This contrasts with traditional approaches to teaching, often uninspiring. For the author, an essential feature of projects is authenticity. Students will not study to learn abstractions that are distant from their reality. They will study to get answers to problems from everyday life. One of the examples mentioned is a project in which students study a private forest reserve to determine the number of trees that can be cut for commercial purposes, without detriment to the environment and according to some management conditions determined by the owners. In this case, students study science, history, geography, mathematics in a meaningful context. They learn from a project inspired by real issues, not from the need to find answers to abstractions.

One of the characteristics of the work under review is the author's insistence that his version of the project methodology integrates new information and communication

technologies very effectively. In examples given in the book, there are descriptions of how students can investigate the information needed to develop the projects in which they are engaged. Bender does not consider that the use of new technologies is determined only by the number of sources, but also by the need for students to learn to deal with means important to the job market.

Bender does not present justifications for the methodology under analysis from the psychology of learning and the pragmatist ideology, like Lourenço Filho and Kilpatrick do.

What can be observed continually in Bender's book is the description of artifacts that are nothing more than texts formatted for publication in cyberspace. The author justifies this form of final result using the idea of authenticity. This choice greatly reduces the chances of arriving at results closer to what happens outside school walls. But it seems that the author tries to reconcile the idea of projects with the way schools function, with schedules, with spaces organized as auditoriums etc.

Another aspect of this work that should be criticized is the instrumental view of the internet. The author suggests that the use of electronic media is essential for a 21st century education, but does not present arguments capable of justifying his claims with solid theories of learning. He even reduces proposals based on constructivist understandings of education, like WebQuests, to exclusively instrumental uses. Bender sees them only as a way to organize proposals for students to seek answers to questions in web sources. And in that sense, he completely ignores the foundations of the WebQuest model, as defined by its creator, Bernie Dodge (DODGE, 1995). This makes me suspicious that the author also uses other methodological references, added to the projects model that he proposes, ignoring its fundamentals.

The project methodology as seen by one of the pioneers of the New School in Brazil

In Brazil, one of the most expressive systematizations of project-based learning is the one by Lourenço Filho (1930). He elaborates his ideas not only from the works of Dewey, Kilpatrick, and other New School authors, but also based on experiments he had been conducting at the Rio Branco School since 1926.

Lourenço Filho shows that the project method is based on a psychology that is opposed to intellectualism. He demonstrates that the project method emphasizes action. In addition, he states that it is focused on the socializing role of school. He assumes that thought does not function in a vacuum, nor is it capable of a purely formal construction of knowledge. It reflects the needs that humanity has in the physical and social environment. This thought, always interested, springs from problematic situations. Thought and action cannot separate. The author believes that thinking is a reduced form of acting with symbols, mainly with language.

Lourenço Filho's theoretical formulations are very close to what Dewey proposes. The Brazilian educator formulates a project method that, besides accentuating

the need for purposeful actions, is attentive to the school's commitments as a socializing agent.

Lourenço Filho reminds us that we do not act only in the physical environment. We act in society. Using current language, we can say that the Brazilian educator saw in the projects the opportunity to negotiate meanings among peers, not only to cooperatively elaborate knowledge, but also to construct understandings for life in society.

Here, it is convenient to make an observation to clarify the understanding that Lourenço Filho and the original formulators of project-based learning had of action. They did not understand that action is necessarily a sign, and that students are engaged in meaningful learning. They always insisted on action with purpose; or, to use a language of our times, insisted on an intentional or intentioned doing. The project method, as Lourenço Filho thought after Dewey, should not be confused with activism.

The Brazilian author proposes a definition of project that should be recorded. He starts by criticizing the idea, predominant in school, that it is necessary to elaborate a knowledge of concepts and principles that, once structured, can be applied. This explanation calls forth more recent criticisms to the idea that scholastic knowledge is a general elaboration that can be applied to concrete cases in processes of transference of learning. In projects, the path is the opposite. We begin with concrete challenges that require elaborations capable of explaining and solving them. To clarify this, four points indicated by Lourenço Filho (1930) should be mentioned:

1. Project aims at the elaboration of a thinking applied to realities.
2. We seek information to solve problems, not to store knowledge.
3. Learning must happen in a natural environment.
4. The problem precedes principles.

The author offers several examples of projects, developed at the Rio Branco School. In all of them there is evidence of student interest, participation, change in the role of teachers, and involvement of parents and the whole school community in the process.

Faithful to the ideals of the New School, Lourenço Filho understands that projects need to come from the students' choices, not from teachers. It is the responsibility of the latter to provide support so that the former can engage in activities necessary for the fulfillment of the purposes of their action.

The original proposal of the project method

Kilpatrick (2010) systematizes the concept of projects, suggesting a path capable of integrating three axes: the idea that action is fundamental in the elaboration of thinking, the achievement of scientific knowledge about learning, and the presence of essential elements for the elaboration of ethics necessary for life in society. This

path is determined by purposeful action. Therefore, activity alone is not enough, it must result in an objective (intentionally) sought by the subject.

The author uses a simple case to clarify the concept of project. He suggests one considers a girl who has just made a dress. If she made it with purpose, if she planned it, and if she made it herself, we have a project. What the girl did happened in a social environment in which the dress is a work that has meaning recognized by others. In giving this and other examples, Kilpatrick emphasizes that action happens socially, it is not just a physical doing, or an intellectual realization detached from the social environment in which it occurs. In this sense, he follows Dewey's proposal that the school has a socializing role.

It should be noted that Kilpatrick imagines that completing projects requires freedom. He follows, once again, Dewey's ideas, understanding that education, to use Paulo Freire's expression, is a practice of freedom. Slaves or servants do not have enough purposes to carry out projects. They act guided by other people's purposes. Projects developed in a consequential manner, with a clear search for purpose, are, besides an efficient method of learning, experiences that favor democratic education. It should be noted that the practice of democracy is not in the subjects, but in the teaching method. Authoritative methods are not democratic practices. A democratic education is not defined by its content, but by the ways in which learners engage in the elaboration of knowledge. Here, the idea is that the most important aspect of learning is the engagement of students to achieve a purpose chosen by them.

The proposed method reproduces the processes of knowledge used in daily life in the school environment. One of the hallmarks of project-based learning is authenticity. The problems that act as starting points for projects are the same as those that need to be solved out of school. The American educator believed that school does not prepare for life. It is a dimension of life. The school here and now is not a preparation for an after. It is life lived as it is.

The project methodology embodies scientific principles established by the psychology of learning. At the time, this psychology privileged experimental approaches, guided by a behavioralist view that explained the elaboration of knowledge from the connections between stimuli and responses. This psychology has a certain proximity to the pragmatist philosophy, since it emphasizes action as an important component in the elaboration of thought. Although nowadays behaviorism is an outdated psychology, the association between project-based learning and the understanding that learning involves action and requires responses of the organism to problems that arise from its relationship with the environment, is congruent with learning conceptions that highlight action as a fundamental learning component.

Pragmatism suggests ways of overcoming the mind/body dualism that prevails in hegemonic explanations of thought and action. Mark Johnson (2007) proposes an interpretation that articulates this philosophical proposal with the current psycholo-

gical readings of thought elaboration, emphasizing that the demands of doing are at the root of the elaboration of meanings:

> Meaning derives from the nature of our bodies and the patterns of interaction we have with the environment; it thus gains form through our values, interests, and purposes as active agents. As Dewey insisted – and cognitive science confirms – thought is never totally divorced from the feeling, value, and aesthetics of our bodily experience (JOHNSON, 2007, p. 103).

Educators that work with projects in their schools need to seek articulations with current psychological approaches that emphasize action as the driving force of knowledge. In this direction, for example, it is worth examining possible bridges between project method and the Activity Theory, developed by Leontiev from the Vygostky's ideas.

Returning to Kilpatrick's text. After establishing bridges between the project method and the psychology of learning, the author revisits the issue of purpose. To do so, he uses an example. He suggests thinking of two boys making a kite, one guided by purpose, another by some form of imposition. The result of the work may be equivalent. But the processes will be completely different. In the first case, the boy not only achieved the desired end, but also enriched his repertoire of knowledge to solve future problems. In the second case, the other boy got the expected result, but experienced a process that cannot be generalized. In commenting on the unfolding of this hypothetical case and relating it to systematic education, Kilpatrick notes that the first boy views school activities with joy, the latter sees them with displeasure.

The project method is not just an efficient approach for the field of school learning. It is a path that identifies with vital needs. Besides the immediate results it guarantees, there is a significant gain in the students' intellectual development. But it is not only in the intellectual field that project-based learning is the best educational path. An essential dimension of the project method is its effect in terms of moral education. Purposeful action requires working with others and the pursuit of a socially negotiated welfare. Instead of a disembodied morality, participating in projects ensures the construction of values from action and agreements (and disagreements) in search of a common good. Project-based learning suggests that ethics is constructed based on actions determined by needs that arise in the environment and that require subjects to make choices that are congruent with intentional purposes.

Kilpatrick (2010) proposes the following typology of projects, dividing them into four purposes:

1. To realize some idea or plan externally, in a tangible work (make a piece of furniture, build a car).
2. To enjoy an aesthetic experience (listening to a symphony, enjoying a painting).
3. To solve an intellectual challenge (why São Paulo grew more than Rio de Janeiro in the 20th century).

4. To ensure mastery of certain knowledge or ability (use two-word verbs in English).

There is a tendency to emphasize type 4 because of its proximity to traditional schoolwork. A tendency, by the way, that appears with much evidence in the work of Bender (2014). Type 3 is also attractive to teachers as it resembles intellectual challenges present in many traditional schoolwork. Type 2 is a big challenge; Kilpatrick says it is not easy to make a suggestion as to how to develop it. Finally, type 1 is quite attractive and with clearer steps of planning.

Kilpatrick's work forms a method that stems from the principles of learning by doing. It systematizes what Dewey had been practicing since 1896. Moreover, it is still a proposal that can make education a process in which acting and thinking are not disassociated.

The danger of domestication

To enter schools, many ideas end up being domesticated, losing some of their most expressive marks. This is what seems to be happening with the project method. In the version presented by Bender (2014), it loses its socializing accent, its traits geared towards a democratic education, its appeal in terms of ethical training, and is seen only as a very efficient teaching option, attuned to the demands of the market.

We saw in Lourenço Filho and Kilpatrick a proposal for project method that values intentional action, citizen training and intellectual development and does not separate acting and thinking. In the work of these two pioneers, the project method is more complete and is not understood only as an efficient way to prepare students for the market. It is a proposal that considers the fundamental reasons that lead humanity to act and think in an articulated manner, seeking integral answers to challenges that are worth facing. Therefore, it is necessary to always return to the pioneers to avoid that the project method be domesticated.

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