



AN APPROACH TO COMMERCIAL AND FINANCIAL MATHEMATICS IN THE PERSPECTIVE OF THE COMPETENCIES DEVELOPMENT METHOD: CONTRIBUTIONS FROM THE TEACHING SPECIALIZATION COURSE FOR VOCATIONAL EDUCATION AT SENAC IN AMAPÁ

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Abstract

Commercial and financial mathematics from the perspective of competency development methodology is the object of this paper, focusing on the teaching practice in vocational education. The implementation of the methodological framework of the study and research actions during the Senac Teaching Specialization Course combined with interactions between attendees. Constructed knowledge converged to the elaboration of Teaching Work Plans, based on Senac/Amapá political-pedagogical proposal and the professional competencies established in the course plans.

Keywords: Vocational education. Teaching work plan. Competencies. Mathematical knowledge.

1. Introduction

Over the last decades, a set of changes reconfigured the world of work by establishing a list of required professional skills, creating the need to train a new professional who can respond to the wishes of organizations.

It is critical to devise and deliver a proposal for training instructors that is capable of having a positive impact on the classroom environment if an education model is in line with the current reality of the world of work.

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Received for publication on 13.9.2016
 Approved for publication on 13.6.2017

With this in mind, the Teaching Specialization Course for Vocational Education stands out, providing a systematic approach geared to the development of the instructor's professional skills: namely, to plan, mediate and evaluate learning situations. The course basis is on the triad action/ reflection/ decision on teaching practice and comprises three guidelines: Research & Production, Experiment, and Systematization.

Thus, this article arises from the experiences lived through during the course and aimed to socialize the knowledge built through the activities carried out in the Experiment learning workshops, supported by the theoretical reference selected during the Research & Production actions.

The ultimate purpose is to put forward a proposal for an approach to the Commercial and Financial Mathematics thematic unit in the Administrative Assistant Learning course, based on the competency development method.

Initially, the theoretical elements that underpin the Teaching Work Plans (PTD) proposal is revisited, including a discussion about planning, mediation, and evaluation, endorsing the views of some researchers whose discourse reinforces and converges to the essential points of reflection proposed by the study.

Then, the article highlights the observations about the experiences from the learning workshops, emphasizing the implementation process. In this phase, the emphasis places on the importance of Commercial and Financial Mathematics as an instrument that the administrator and, consequently, the administrative assistant will employ to analyze data, interpret information and make decisions from a managerial point of view.

In the argumentation, there is an interweaving between the assumptions of Senac/Amapá Pedagogical Political Project (PPP), the competencies expected in course plans and the learning situation developed in the workshops, seeking to justify its importance and applicability.

The conclusion emphasizes the importance of the competency development method for the construction of meaningful learning. Moreover, reflects on the impact that constructed knowledge had on the teaching practice in the scope of the commercial and financial mathematics classes.

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2. A few theoretical references that underpin the PTD proposal or the theory did practice

The significant changes that the world of work has been going through because of economic, social, political, technological, scientific and cultural factors require vocational education institutions to make a stand about their political-pedagogical proposal, considering the professional they wish to train.

These changes require a major factor that designs a training process for those instructors who will be working in this type of teaching, given the specificities of the professionals that seek qualification for the labor market. The market is dynamic and is reconfiguring at all times, so the pedagogical practices developed ten years ago no longer fit the current reality.

In this way, there are expectations of an efficient vocational training model not only to provide the individual with learning activities that favor the development of their ability to efficiently solve problem situations but also to allow them to operate the different technologies available in the work environment.

The National Service for Commercial Apprenticeship (Senac), established in 1946, is a non-profit institution and its political-pedagogical project (SENAC, 2012c, page 11) is geared to “train for working in activities related to the Trade in Goods, Services, and Tourism.”

Senac exists in the state of Amapá since December 14, 1974, when was established through Ordinance no. 125/74, based on Resolution Senac no. 217. For fulfillment of its institutional mission, Senac’s Political Project in Amapá has proposed new paradigms in teaching and learning practices seeking to overcome methods and teaching techniques oriented to the teacher’s action. With this in mind, Senac highlights the need to build a school that trains for life and work, building on a citizen-oriented perspective. Thus, the school should not be a space for the mere transmission and reproduction of knowledge, but a place where the individual can learn to learn.

In this way, the curricular and methodological organization of the courses delivered by Senac in Amapá relies on the four pillars of education: learning to know, learning to do, learning to live, and learning to be. As a result, the professional profile at the completion of the courses delivered by this institution aligns with the needs of the current world of work.

However, all the proposals focused on education at any levels or modalities materializes in the context of the classroom. Therefore, Senac delivers the Teaching Specialization Course for Vocational Education focused on instructors and pedagogical technicians and based on the competency development methodological proposal, which, in turn, relies on the pillars of education. Such proposal holds the teaching action as a consciously and systematically planned task, not a scripted planning, but rather a coherent sequence of methodological steps, designed by the instructor to the development of students' professional competencies.

The training of a vocational education instructor should not rely on the transmission of purely theoretical information about how to act in the classroom, according to what is planning, the curriculum, and the evaluation. It should include such actions where the instructor can experience with the student those steps to be in development in the classroom. Consequently, the Teaching Specialization Course for Vocational Education provided Senac's instructors in Amapá with a series of theoretical and methodological actions aimed at developing the skills to plan, mediate, and evaluate learning situations.

For this research, it was decided to deepen the learning situation "Application of mathematical knowledge in the set-up of a company's financial planning", throughout the readings and experiences of the course. This learning situation consists of a proposal that was developed and improved during the commercial and financial mathematics classes delivered at the Administrative Assistant Learning course. Having a better understanding of the intention of this study, it is essential to revisit some concepts, such as planning, competency, evaluation, and mediation, which enable the instructor to prepare and execute a PTD that is in line with the Institution's pedagogical proposal.

The discussions about planning, to the design and execution of a PTD, start by directing the instructor's view towards the Course Plan (CP) to analyze both their vocational training proposal and the profile at completion presented and its adaptation to the trends of the world of work. The point of convergence in this initial study is the instigation of knowledge about a CP proposal.

In this perspective, Fusari (1988 apud PADILHA, 2002, page 37) highlights that the Course Plan design thinking:

is a document employed as a roadmap, providing the direction established by the educators, where the starting point, the route and the point of arrival of the individual-collective work of school educators are to be clear.

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The author makes evident the importance of the course plan for the development of the pedagogical action. Any instructor that fails on getting to know it will be in the risk of working on a thematic unit without knowing the purpose of the job. They will have a fragmented view of the vocational training process. In addition to knowing the plan, the instructor must also know how to analyze its information and propose changes when necessary.

Building on the proposal presented in the course plan, the instructor will implement it through the set-up of a Teaching Work Plan, which is the planning of how the CP will take effect in practice. Vasconcelos (2006) states that plan means anticipating an action. Vasconcelos also highlights that the act of planning contributes to the intended achievement.

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What is desirable in the implementation of vocational training courses is to promote the development of competencies, thereby allowing any individual to settle complex situations autonomously within their work context. Thus, any class based on the accumulation of information will not comply with the Senac's CP proposal.

The PTD must include all information pertinent to the ongoing course, the work unit, the competencies in the unit (based on the CP skills) and a set of learning situations, including their respective activities, resources, and forms of evaluation. With this, the instructor will know how and why he/she will be performing their pedagogical activity.

It is common knowledge that is necessary to train a particular professional for each kind of work world. The current trend includes skilled training professionals, people capable of using different languages in different contexts, who know how to argue, recognize problem situations and design intervention proposals with creativity. Such worker must be able to adapt to changes and keep a good interpersonal relationship.

Vocational skills are countless, and they are not restricted to the student but also extend also to the instructor, who must be able to plan the actions for the development of such skills. According to Küller and Rodrigo (2012, page 6) "Competency is required to face life's challenges and society and work coexistence's daily and unusual problems."

Competency includes the mobilization of knowledge, i.e. when any individual faces the need to seek a solution to a given problem situation. Competency comprises knowledge, skills, and attitudes built and developed throughout the individual's experiences.

Developing skills implies proposing learning situations with a potential to simulate real situations in which the student feels challenged and motivated

to participate both individually and collectively. Some suggestions include study through the project, problem-solving, dramatization, study through research, and case studies.

In this perspective, Küller and Rodrigo (2012) propose a sequence of methodological steps that go beyond the planning of scripted classes. They present the competency development method, which consists of a set of actions (learning situation) to be carried out by the students under the mediation of the teacher, aiming at the competencies listed in the CP. The methodological steps include contextualization and mobilization, learning activity, an organization of learning activity, coordination and monitoring, analysis and evaluation of learning activity, other references, and synthesis and application.

The intention of such learning situations is to favor the development of students' professional competencies, which is the focus of the educational activities. The teacher will be the mediator in learning. He/she should propose, guide and give conditions for the construction of knowledge. According to Küller and Rodrigo (2012), this process occurs through the methodological step named "Coordination and follow-up."

According to Santoro et al. (2013), coordination relates to the control and organization of the educational process, to provide space for students to make decisions collectively, solve conflicts, interpret, infer, design and become involved in planning and performing their tasks.

When proposing, for example, a problem situation for a students' group discussion seeking to find alternative solutions, the teacher has the responsibility to organize the moment for building the expected tasks. In addition to coordinating, the instructor must follow the progress of the works, observe, interact, direct, motivate and help when doubts arise, always aiming at the autonomy of the student.

It is through this monitoring that leadership behaviors become evident, with the potentialities, the difficulties, the commitment and the exercise of interpersonal competency in action. Knowing how to work as a team is a vital skill in today's world. Group activities are motivating; through them, the instructor will be able to approach conceptual, procedural information and contribute to the consolidation of values and attitudes.

The assessment of learning situations goes beyond the exclusionary logic of the mere application of evaluation tools. It occurs throughout the process and takes into account the development of the individual about professional skills. It is not only a question of checking student's performance, but also

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of analyzing the teaching practice from didactic planning and transposition adequacy.

Evaluation cannot be an isolated moment in the teaching and learning processes given its relevance in the context of a pedagogical project. After all, the way in which the evaluation carries out will favor or not the training of competent people in their area of activity and, at the same time, capable of the exercise of citizenship (RIBEIRO et al., 2004, page 80).

From this perspective, Senac's Political Pedagogical Project (SENAC, 2012c) guides the application of evaluation tools that are capable of integrating technological basis to learning situations to stimulate student's autonomy. Such activities can be in action, either individually or in groups, but always related to the real context of the work.

The result of the evaluation defines itself by the competencies constructed, so it is critical for the instructor to know Senac PPP references and its learning evaluation proposal as far as vocational education is concerned. In the development of the learning workshops, as applied in this analyzed course, the authors tried to evaluate learning situations, based on their stimulation mechanisms designed for students' active participation in individual and group tasks, based on the solution of problem situations, encouraging creativity, communicational ability, interpersonal relationships, and autonomy.

3. Reflections on the Learning Workshop

When planning and implementing a course aimed at professional qualification oriented to market needs, it is important to consider both theoretical and practical elements that will allow attendees to think and rethink their practice in the labor action.

The Teaching Specialization Course for Vocational Education is no exception because its design has an impact in the classroom context. Thus, in addition to reading and exchanging experiences, learning workshops were provided, key components in the Experiment Axis, focused on action-reflection-action on teaching practice.

The Learning Workshop design relies on the learning situation required for the PTD Commercial and Financial Mathematics (Application of mathematical knowledge in the set-up of a company's financial planning).

The course Administrative Assistant Learning and topic unit Commercial and Financial Mathematics for analysis and application of the activities described in this study. For the Learning Workshop, the learning situation named

“Application of mathematical knowledge in the set-up of a company’s financial planning” deals with a planning focused on the development of competencies as it aligns with the objectives, professional profile at completion, skills and the curricular organization proposed in the Course Plan.

According to the profile at completion, the apprentice will be able to perform the necessary procedures required in the administrative departments of a company. A strategic sector in the context of a commercial enterprise is that of finances, so the learning situation focused on the planning and importance of commercial and financial mathematics to make managerial decisions, to take care of the “financial health” of the company.

In this way, all actions carried out had the support by the following competencies: Identifying the applications of mathematical knowledge in the relationship between company and market; Understanding the concepts and the algorithms of percentage and simple and compound interest as a tool used by the financial management of a company; and Communicating with clarity and objectivity using mathematical language.

The Competency Development Methodology unit in the Research and Production axis supported the recording of such reflections about the experiences from the Learning Workshop. The path consisted of the process of learning as a student, the steps to be developed in the classroom, which requires the competency to plan, mediate and evaluate learning situations.

The studies in this unit provided an understanding of the required methodology for professional education courses; a method focused on the student in learning situations that enable simulating real situations and their conflicts. Such situations must be challenging, stimulating, conducive to the development of professional competencies and, above all, must rely on the elaboration of the capacity to learn to learn.

Küller and Rodrigo (2012) theoretical contribution regarding the competencies development methodology and its seven methodological steps was a necessary basis to enable perceiving more clearly the paths in such study and experiment activities.

During the Workshop, the learning situation named “Application of mathematical knowledge in the set-up of a company’s financial planning” focused on the development of the following professional competencies: Applying percentage and interest concepts in the solution of problem situations in a microenterprise financial management; Using commercial and financial mathematics concepts to understand and act in the managerial decision-making process in a microenterprise; Using technological resources to seek useful information to understand the dynamics of trade;

and Identifying organizational strategies involving the manipulation of numerical information.

In step 1, the presentation of the video *How to manage small businesses* was accomplished through contextualization and mobilization, featuring a problem situation in which students are required to find possible solutions in-group discussions. Next, students are required to list which mathematical knowledge would they mobilize in each proposed situation.

In the development of step 2, the learning activity had based on the solution of problem situations, considering that these would allow the students to experience situations near to the real context of the events in the world of work. In the organization of the learning activity described in step 3, it was possible to present the video featuring the song *Dívida* (the Rappa), which raises issues related to interest rates. The students were then required to research the concepts of trade, domestic and foreign trade, as well as to gather information about the need to charge interest in commercial operations.

Step 4 presented the coordination, and the monitoring development with the orientation for the activities proposed, as well as the “inducement” made by the teacher seeking to provoke the interest and the curiosity of the students. In step 5, the evaluative process was more focused on corporate productions, analyzing the strategies adopted, the applications of available resources and oral and written communication using mathematics as a tool and language applied to the administration.

In step 6, access to other references through Internet searches aiming to increase the level of knowledge related to the financial management of a small company. In this way, the teachers asked the students to look for information about the trade.

The research on the concepts of trade, domestic and foreign trade, and the reason why interest charged on commercial operations also provided the theoretical support necessary for students to realize that many decisions to buy and sell products and services rely on numerical data, which, after interpretation, converted into relevant data.

In the synthesis and application presented in step 7, the students developed a simplified financial planning for a small size company, taking into account the costs of production, the calculation of the items per unit, the sale price and the profit percentage in achievement. This proposal allowed a better understanding of the application of Commercial and Financial Mathematics in managerial decision making.

It is worth mentioning that the activities developed in this workshop aimed at solving problem situations in groups. It favored mutual coexistence, the exchange of experiences, communication situations and the understanding that constructed knowledge is applicable in various contexts of life and work. The breadth of this applicability is because the commercial and financial mathematics “is the mathematics of money,” and people are at all times manipulating monetary values, buying, selling, trading, investing, and planning their investments.

By establishing a comparison between the results obtained in the Learning Workshop, it was possible to achieve more satisfactory results, since the managerial approach proposed in the learning situation was not limited to the context of one company. It was rather broadened to consider trade in general and its influence on the structure and functioning of organizations. Besides, the set-up of a financial plan made the application of mathematics a more systematic action.

4. Concluding remarks

The dynamic of the transformations in the world of work reconfigures the behavior models and the knowledge necessary for the entry and climbing in the various fields of human activity. Otherwise, the professional profile sought by organizations changes regularly, presenting to attendees indications of what will be necessary for success in life and career.

Currently, organizations are looking for a professional who respects diversity, who is capable of autonomously solving problem situations, recognizes goals and recommend viable actions to achieve them, is honest, as the ethical position is also a requirement. Such professional must be proactive, innovative, communicative, motivated, leader, flexible. He/she must be able to learn always.

To meet the desired profile, a model of vocational training based on competency development and on the pillars of education (learning to know, do, live, be, and learn) is necessary. One can think of inserting a new pillar, which would be “learning to undertake”, since the entrepreneur is not only the one who owns a company, but also the creative player who has initiative, spirit, and leadership.

Faced with the demands of the world of work, it becomes necessary to reconfigure those institutions that deliver vocational training courses. A relevant point in this process is the rethinking of the practice of any professionals who act as instructors because their action in the classroom

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must be of awareness and systematic, given the development of a set of professional skills.

In this perspective, the Teaching Specialization Course for Vocational Training delivered to Senac/Amapá instructors provided theoretical and methodological subsidies that enabled action-reflection-action on the teaching practice in service. Structured around three axes, Research & Production, Experiment, and Systematization, it allowed the training of professionals to be apt to train other professionals, so that they could develop the skills to plan, mediate and evaluate learning situations, according to the competency development methodology.

The differential of the course is the actions that make the instructor to live as a student the methodological steps applied in the context of the classroom through laboratory activities. These, in turn, rely on the proposed Senac's Political-Pedagogical Project and the Course Plan object of study and experimentation.

Knowing the PPP of the institution and the CP provides the more stable foundation for the design of Teaching Work Plans. The workshop activities planned according to the competencies described in the CP assures this assertion. This article proposed the "application of mathematical knowledge in the set-up of a company's financial planning" as a learning situation.

Experiencing the proposed learning situation was a challenge that generated significant changes in the commercial and financial mathematics classes, which previously used to be an exposition, merely technical and guided by the learning of mathematical concepts and algorithms.

In the competency development methodology, the learning situation presentation through the solution of problem situations designed in such a way as to allow the student to experience, in the classroom, a situation similar to the real context of the work, thereby mobilizing the mathematical concepts and algorithms in practice.

This experience led to reflections on the pedagogical practice, resulting in the belief that, in general, it is indispensable to have a change of attitude on the part of the teacher. Teachers can perceive themselves as mediators of the teaching and learning process and recognize that the student is the subject who will be developing the professional skills. It requires that the planning, the mediation and the evaluation of the learning be conscious and systematic actions given the development of the competencies described in the Course Plan.

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Based on the experiences, the training of the students in the perspective of the competency methodology gains regarding quality since the students get a better view of the relevance of the studied technological bases and their application in the context of the work.

Without this methodology, classes are at the risk of becoming empty and meaningless to life and labor. Thus, it is necessary to foster spaces for discussion where instructors can collectively plan their pedagogical actions to meet the demands of the world of work and implement, in practice, the political-pedagogical proposal of the Institution.

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