An online course fostering
self-regulation of trainee teachers

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Self-regulated learning (SRL) can be fostered by teachers' behaviour and feedback and by the creation of suitable learning environments. This paper tackles the problem of how to develop attitudes and competences enabling teachers to act in support of their students' SRL. To this end, teachers should be aware of their own self-regulation of both learning and teaching behaviour, so as to cope flexibly with the needs of their students. This paper analyses the features and the rationale behind some of the online collaborative activities proposed to trainee teachers, in the context of a course on Educational Technology and investigates their effects in terms of SRL practice during the course. The investigation was based on the analysis of the interactions among the trainees, searching for indicators of self-regulated actions and distinguishing among SRL phases (planning, monitored execution and evaluation), SRL components (cognitive/metacognitive and emotional/motivational), and working mode (individual and social). The outcomes of the interaction analysis show that self-regulated actions were repeatedly carried out during the course, confirming the expectations of the instructional designers. The study distinguishes between the different types of SRL actions carried out by the trainees, shedding light on the relationship between tasks and effects of SRL practice.

Curso en línea para el fomento de la autorregulación del profesorado en prácticas. El aprendizaje autorregulado (SRL) puede ser apoyado por el comportamiento de los docentes, la retroalimentación y la creación de entornos de aprendizaje adaptados. Este trabajo aborda el problema de cómo desarrollar actitudes y competencias, permitiendo a los profesores actuar para apoyo de la SRL de sus alumnos. Con este fin, los profesores deben ser conscientes de su propia autorregulación de la enseñanza y el aprendizaje tanto de comportamiento, para hacer frente de manera flexible a las necesidades de sus estudiantes. Este trabajo analiza las características y las razones de algunas de las actividades de colaboración en línea propuesta de estudio a profesores en prácticas, en el contexto de un curso sobre Tecnología Educativa, e investiga sus efectos en términos de práctica SRL durante el curso. La investigación se basó en el análisis de las interacciones entre los alumnos, en busca de indicadores de acciones autorreguladas y distinguiendo entre las fases SRL (planificación, ejecución y evaluación de seguimiento), los componentes SRL (cognitivas, metacognitivas y emocional / motivacional), y la forma de trabajo (individual y social). Los resultados del análisis muestran la interacción que acciones autorreguladas fueron llevadas a cabo en varias ocasiones durante el curso, lo que confirma las expectativas de los diseñadores instruccionales. El estudio distingue entre los diferentes tipos de acciones SRL llevadas a cabo por los alumnos, arrojando luz sobre la relación entre las tareas y los efectos de la práctica SRL.

Self-regulation of learning entails the individuals' capacity to actively and consciously control their own learning processes in terms of cognition, motivation and behaviour (Zimmerman, 1998; 2000). It matters not only for autonomous learners, but also for learning in social contexts. In the case of a classroom, the self-

regulation process does not concern only students, but also teachers (De la Fuente & Justicia, 2007; De la Fuente et al., 2007), because the interaction among these subjects strongly influences the orientation of thoughts, feeling and actions involved in the learning process.

Learning to be self-regulated is necessary for teachers in order to deal with the complexity of the teaching role, which requires to take care of different factors. From the personal and individual point of view, teachers need self-regulation to understand themselves as teachers and keep up their motivation (Cardelle-Elawar et al., 2007). In their profession, they need to cope with diverse population of students, pursue different tasks, goals and

objectives, and make use of a variety of tools, methods and concepts. In this ever changing, complex scenario, they have to constantly nurture their motivation, sense of purpose, commitment, satisfaction and effectiveness.

From a social point of view, teachers need self regulation to understand their students' needs, to sustain their learning and relational growth, to stimulate their way of thinking and their creativity, to balance the scheduled time with moments of independent regulation (Paris & Winograd, 2001; Bolhuis & Voeten, 2001). Furthermore, they need adaptability and invention, to cope with the variety of situations they face in the classroom and to adjust to the ever more frequent curricular revisions required by the fast pace of technological and cultural change. They also benefit from improving their self-efficacy, which is necessary for effective classroom management. Some studies, moreover, have shown the importance of supporting motivation and the affective aspects of learning in order to positively influence pre-service teachers' confidence (Corrigan & Taylor, 2004).

The assumption that SRL can be improved through practice is widely accepted in the literature. According to Van den Boom et al (2004), the acquisition of SRL competence can be stimulated by embedding aspects of SRL in instruction and study tasks. Dabbagh & Kitsantas (2004) claim that web-based pedagogical tools, such as collaborative and communication ones, can support students' development of self-regulatory skills to successfully work in online environments. In addition, some studies (Corrigan & Taylor, 2004) point out that flexible, student-centred context conditions which promote active learning help to foster SRL in trainee teachers.

The aim of this paper is to analyze how SRL was enhanced through practice during a blended course addressed to pre-service teachers. Most of the online activities were designed so as to attain the course aim of developing Educational Technology competences among the trainees while keeping an eye on the need to sustain the practice of SRL and to help the trainees to increase –individually and collaboratively– their control over the learning process.

Method

A course supporting trainee teachers' self-regulation

The considered experience was carried out within a course on Educational Technology run for a teacher training school in the year 2004/2005. This blended, three-month course integrated twelve weeks of online activity with five face-to-face (f2f) sessions, aiming to introduce the subject and to stimulate effective online participation. Taking part in both online and f2f activities was required for credit.

The course involved 95 trainees with different backgrounds, and 7 tutors. For most of the students (89%) this was the first exposure to Computer-Mediated Communication (CMC) in formal learning activities, while 6 of the 7 tutors had already tutored online. The students were organized into workgroups, each supported by a tutor; group compositions was changed three times over the course, to better suit the requirements of the tasks proposed.

Online work involved collaborative production of documents, peer reviews, web-navigation, joint or individual analysis of online learning resources, joint or individual reflection and readings. It

was articulated in five sequential modules, each of which devoted to a precise task and applying a different learning strategy, plus two modules on socialization and meta-reflection which were run in parallel to the other ones. Communication was mainly asynchronous.

In the current study we are focusing in particular on the tasks carried out in four of the sequential course modules, which appear particularly suited to familiarize trainee teachers with SRL (Table 1). We did not consider one of the sequential modules (the second one) because it involved a limited amount of SRL-related skills. Neither did we consider the Meta-reflection module, because meta-reflection is an explicit self-regulation activity, and hence its analysis did not seem to add much to the understanding of how the structure of online learning activities can contribute to teachers' SRL competence.

Task 1 – Familiarization and socialization activity

This task lasted three weeks and was devoted to familiarizing with the platform and the distance learning mode, as well as to acquainting with the course mates. The importance of a socialization phase is highlighted by many authors (Nicholson, 2002; Ziegler et al., 2008). The tutors' behaviour in this phase is aimed at raising motivation, reducing anxiety, encouraging self-assurance, encouraging the trainees to remain focused on the assignment and to complete it by the module's end. The metaphor of navigation was proposed to create a framework where it could make sense to assign some simple collaborative activities which entailed no content-related cognitive load, but only brainstorming, negotiation and synthesis, which are regulatory devices for collaborative activity. The course was described as a sea-journey in which each participant was supposed to choose one boat among seven, giving name to sub-conferences in the Familiarization area (caravel, cruise liner, fishing-boat, motorboat, sailing boat, steamboat and submarine). Once joined one of these groups, the participants had to explain the reason of their choice and to work out, with their group-mates, a name, a motto and a symbol for their boat.

Despite its apparent playful character and simplicity, this task was important to set the basis not only of effective online collaboration, but also for an explicit focus on SRL: explaining personal choices aimed to stimulate self-reflection, while the joint selection of name, motto and symbol was an exercise of negotiation and synthesis. Moreover, no indication was provided about how to manage the activity, such as setting intermediate deadlines and decision strategies, so as to lead the learners to experience that learning activities, especially online interactive ones, need to be planned and constantly monitored towards the goal achievement, no matter how simple is the task assigned. The metaphorical setting, finally, aimed to encourage and facilitate the expression of feelings towards the new learning experience, so as to favour self-awareness and the establishment of a positive social climate (Manca & Delfino, 2007). It actually favoured the emergence of personal attitudes, expectations and fears.

Task 2 - Analysis of online educational activities
by means of role-playing

This task, which followed a content-related one that is not relevant for this analysis, lasted three weeks and was devoted to

online educational resources. It consisted in a WebQuest about educational WebQuests. Students were assigned by the tutors to twelve different subgroups, based on their background and on the behaviour they had shown in the previous activities.

The task consisted in a role-play scenario where trainees were requested to (1) take on the role of strongly characterized teachers (the technology enthusiast, the technology detractor, the bureaucrat, the principal, etc.); (2) discuss strengths and weaknesses of three WebQuests from the points of view of the roles taken; (3) jointly chose which of the three WebQuests appeared more suitable for an interdisciplinary activity in school; and (4) suggest improvements so as to minimize its weaknesses and to improve its strengths. The task entailed both individual and collaborative phases of work.

From the point of view of SRL, this task represents a good opportunity to practice in a disciplinary context the skills introduced in Task 1: the joint choice of one WebQuest entails explanation of one's motivations and negotiation, while the improvement phase requires mediation and synthesis of the contributions of all. The articulation of the task requires work organization even though intermediate deadlines were given by the tutors. The comparison of different examples developed in real school settings, moreover, aimed to stimulate evaluation skills by comparing peers' productions, which is a good starting point for self-evaluation. Playing the roles of teachers with strongly defined characteristics, finally, calls the attention on the emotional side of actions (among which learning) and helps the participants become aware that choices are often biased by preconceptions and personal beliefs. Alternating individual and collaborative work allowed the tutors to stimulate self-regulation in both learning contexts.

Task 3 - Case studies on Computer Supported Collaborative Learning

This task, which followed Task 2 and lasted three weeks as well, was a case study on school-based learning communities. The group composition remained the same as in the previous task. Here, the trainees were asked to discuss assets and flaws of some real school projects recently carried out by small groups of teachers with their classes, based on documentation provided on the project's organization and running. In particular, trainees were requested to (a) read three case-studies, (b) share a detailed analysis with group mates and (c) cooperate to write a shared document based on the results of the individual analysis. In this case, no intermediate deadlines were given, so as to stimulate the learners to make their own planning.

From the point of view of SRL, this task offered the opportunity to practice in a different setting all the skills previously introduced. It was important, in particular, that in this case the trainees were requested to tackle the task from their own point of view after having used strongly characterized roles in the previous task, which aimed to underline the fact that often opinions are biased by preconceptions. Turning to express their , own point of view aimed to help them to take a more reflective attitude in the analysis of the assigned projects. Maintaining the same group compositions in Tasks 2 and 3 aimed to increase a sense of group belonging and to reinforce collaboration dynamics, favouring work organization and reciprocal help, as well as the creation of a favourable context to allow emotional and motivational aspects to raise.

Task 4 – Summing up activity

Task 4, which was carried out for one week at the end of the course, resumed the metaphorical theme. The participants were again requested to choose a boat (represented by a sub-conference in the task's interaction area) and explain the reasons for their choice. The boat could be the same chosen at the beginning or a different one. This was the starting point of an individual reflection on the learning experience, followed by a shared discussion, pointing out competences acquired, difficulties met, new contents and learning methods, impressions on CMC and its possible use in the school setting, etc.

This reflection task was essentially individual, even though giving rise to a shared discussion, in that it was not requested to produce any joint output, and hence no negotiation and synthesis were involved. Evaluation of the experience, on the other hand, was explicitly requested, and the fact to share, and hence implicitly compare, different accounts aimed to stimulate self-evaluation of the amount and quality of the work done, by comparison with peers.

SRL-favouring activities	Task 1	Task 2	Task 3	Task 4
Planning	X	X		
Monitoring	X	X		
Negotiation	X	X	X	
Synthesis	X	X	X	
Mediation	X	X	X	
Practice of acquired skills in different context		X	X	
Alternating individual and social work		X	X	
Self-reflection	X		X	X
Evaluation by comparison		X		
Self-evaluation by comparison with peers				X
Explanation of motivation	X	X		
Expression of feelings	X			X
Expression of motivations and emotions	X	X	X	X

Table 1
Summary of the SRL-related actions required by the four tasks.

Data on trainees' self-regulation from interaction analysis

In order to understand if and how the expected SRL skills were actually practiced, it is useful to observe what happened during the course. This could be done thanks to the fact that, in CMC, interactions take place in written form and are permanently stored in the platform. The adopted approach consists in detecting indicators of self-regulated actions in the messages exchanged within the working areas, while carrying out the learning activities, as they emerge from the participants' own words. Its main advantage is that data collected in this way are not based on the learners' conscious opinions, as it is the case with interviews and questionnaires, but on the interactions that have taken place, and hence they reflect the actions that students actually carried out. In other words, these data reflect very pragmatic information, rather than opinions of the learners.

Procedure and Assessment

The investigation of learning dynamics by means of Interaction Analysis (IA) is a research methodology which has been increasingly used in the past years to explore both cognitive and affective aspects of collaborative discourse. It relies on discourse analysis (Gee, 2005) and consists in detecting phrases and expressions that reveal aspects of interest in the written messages exchanged. The variables investigated may be manifest, that is, visible and objectively recognisable (which makes the analysis process simple to automate), or latent, i.e., implicit in message content (which entails the need for a semantic analysis).

In order to be applied, IA requires a set of indicators of the object of investigation. Several research studies applying content analysis in CSCL have proposed different sets of indicators related to different variables, sometimes trying to work out better focused indicators for some aspects already studied by others, other times focusing on a different aspect (De Wever et al., 2006).

Dettori and Persico (2008) have proposed a set of indicators explicitly addressing SRL in CSCL environments, based on the detailed and widely adopted characterization of SRL proposed by Zimmermann (1998; 2000), and taking into consideration some subsequent studies on the potential support to SRL granted by Technology Enhanced Learning Environments (Steffens, 2006). In this view, SRL appears to be characterized by two orthogonal sets of aspects, named "process" and "component" model of SRL. The process model highlights three phases that are cyclically repeated and influence each other during SRL: planning, monitored execution, and evaluation. The component model, on the other hand, distinguishes among the cognitive (behavioural), meta-cognitive, motivational and emotional aspects of SRL. The two models can meaningfully be considered both at the individual and

at the social level. This characterizes SRL as a 3-dimensional process, in which three independent sets of features can be observed. This gives rise to twelve groups of indicators (see Table 2), as cognitive aspects are grouped with meta-cognitive ones and motivational aspects are grouped with emotional ones, since in both cases it is often difficult to clearly mark the separation between one and the other. All the variables involved are latent, because self-regulation cannot be associated with the use of particular expressions or constructs, but, rather, it is revealed by the fact that learners carry out some kinds of actions. Hence the analysis needs to be done on the semantic level.

Results

The indicators detected

In the described experience, the analysis was based on manual coding of the 1949 messages exchanged by the participants, made by two coders who looked for occurrences of SRL indicators in students' messages. The inter-rater reliability was computed with Holsti's method on a subset of 154 messages and resulted 0,83. Disagreements were resolved through discussion and complete consensus was reached. The remaining messages were split in two parts and each rater only coded one half of them, consulting with the other rater in case of doubt.

It resulted that 897 messages out of 1949 (46,02%) contained at least one indicator of SRL, for a total of 1247 indicators, and the average number of indicators per SRL-related messages was 1,39. The percentage of indicators detected are shown in Table 3 and Figure 1.

Table 3
Percentage of indicators detected for the 4 considered tasks.
The totals in the last column are represented in Figure 1

%	Task 1	Task 2	Task 3	Task 4	Total %
PCI	1,52	2,09	0,72	1,52	5,85
PCS	7,46	1,52	2,25	0,56	11,79
PMI	0,48	0,40	0,08	0,16	1,12
PMS	1,92	0,08	0,48	0,24	2,73
MCI	0,96	0,24	0,32	3,21	4,73
MCS	13,31	4,81	3,05	2,89	24,06
MMI	3,13	1,36	1,36	2,49	8,34
MMS	4,89	1,12	0,96	1,04	8,02
ECI	0,72	1,68	0,80	6,82	10,02
ECS	0,64	0,48	0,72	1,84	3,69
EMI	0,80	0,00	0,16	5,05	6,01
EMS	2,41	2,33	3,13	5,77	13,63

Table 2
The 12 groups of indicators used in the analysis approach applied

Cognitive/metacognitive Individual Planning (PCI)	Cognitive/metacognitive Individual Monitored execution (MCI)	Cognitive/metacognitive Individual Evaluation (ECI)
Cognitive/metacognitive Social Planning (PCS)	Cognitive/metacognitive Social Monitored execution (MCS)	Cognitive/metacognitive Social Evaluation (ECS)
Motivational/emotional Individual Planning (PMI)	Motivational/emotional Individual Monitored execution (MMI)	Motivational/emotional Individual Evaluation (EMI)
Motivational/emotional Social Planning (PMS)	Motivational/emotional Social Monitored execution (MMS)	Motivational/emotional Social Evaluation (EMS)

These data show that indicators of all of the twelve groups were detected, but their distribution is quite uneven. This suggests that the tasks proposed triggered a good variety of self-regulation actions, confirming the expectations summarised in Table 2. The most frequent indicators correspond to cognitive actions of monitored execution at social level (MCS): this is coherent with the fact that the aim of the four tasks was to start up cognitive/metacognitive activities and that the social level is obviously privileged in the communication, especially in the first three tasks which were mostly based on collaboration. The high percentage of these indicators suggests that the trainees diligently took care of the assigned tasks and carefully monitored their realization. Table 3 shows that the value of this indicator is very high in the first task (13,1%), then drops to 4,81% to decrease further in the other tasks. Since the tasks were proposed in sequence, this downward trend is also a decrease over time. A possible explanation for this is that the need to monitor the learning process decreases while the students become more confident and communication inside the groups becomes more effective. The value of this indicator for Task 4 (2,89%) is almost surprising, considering the individual nature of Task 4, that entailed a self-evaluation and meta-cognitive reflection, without the construction of a joint output. Probably, at the end of the course the trainees were so used to relate to their peers that they kept doing it even when not explicitly required. This can be considered an important achievement in light of the teaching profession since it reflects an attitude towards comparison and collaboration which is an important ingredient of teachers' self-regulation.

The less frequent indicator, individual planning at motivational/emotional level (PMI), presents low values throughout the tasks, with a total of 1,12%. These low values are not surprising, given the nature of these indicators: in the context of collaborative activities the need for expressing individual motivation is hardly felt, unless it is explicitly required. As a matter of fact, it is no coincidence that the highest value of this indicator is in Task 1, where trainees were invited to express their expectations about the course they were approaching and the metaphorical language was used to favour the expression of emotions. With regard to the importance of this category of indicators, it should be noted that teachers' self-regulation competences include awareness that coping with the difficulty of learning situations entails taking into consideration not only the cognitive, but also the emotional aspects.

Let us now look at the distribution of the detected indicators by summarizing along the process model that distinguishes the planning, monitoring and evaluation phases of SRL (Figure 2). Firstly, it should be noted that the percentage of indicators of the monitored execution is higher than that of the other two phases. This is quite expectable as the four tasks consisted in content-related activities and the trainees obviously tackled them in the way they were accustomed from their school education, that is, by working on the assignments and paying little attention to planning and evaluation which, at least in the Italian school system, are traditionally made by the teachers with little involvement of their students. This prevalence of monitoring actions, however, is stronger for Task 1, while it is evident, that the disproportion among the three phases decreases over the tasks, which suggests a positive answer of the learners to the stimula provided by the proposed activities. As far as Task 4 is concerned, evaluation indicators obviously prevail, as this was the last activity of the course and it explicitly required evaluation of the work done and of the learning achieved. Surprisingly, some planning indicators were also detected, mostly due to trainees expressing their intention to apply what they had learnt in their future teaching practice. This can again be taken as a positive answer to the activities' stimulation to apply acquired skills in different contexts.

Figure 3 presents a synthesis of the detected indicators related to SRL aspects. In Task 1 and Task 2 cognitive/meta-cognitive indicators are much higher than motivational/emotional ones. This may be due to the fact that, in our school, cognitive aspects are usually considered more a diversion than an effective contribution to learning. The proportion is almost double in Task1, where the navigation metaphor created a playful context and the assignment required no cognitive effort but only promoted awareness of the new way of learning. The proportion between the two aspects becomes more than double in Task 2, probably due to the nature of the task which had a strong cognitive component and hence could easily be seen by the trainees as "no place for playing". Here the participants, moreover, were playing a well defined role, and were likely in the position not to speak for themselves. In Task 3 the distribution between cognitive/metacognitive and emotional/motivational aspects becomes more balanced. As pointed out above, playing the role of a strongly characterized
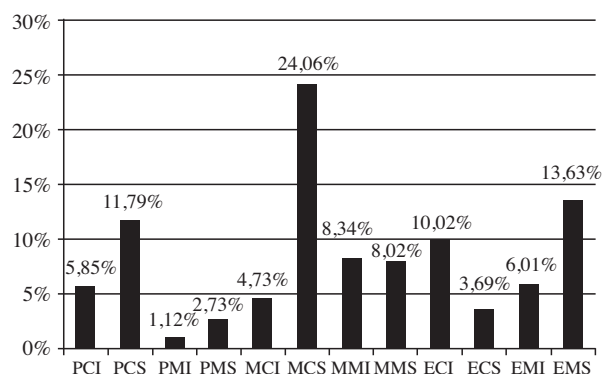

Figure 1. Percentage of the 12 SRL-indicators revealed by the analysis of the messages exchanged by the learners in the 4 considered tasks.
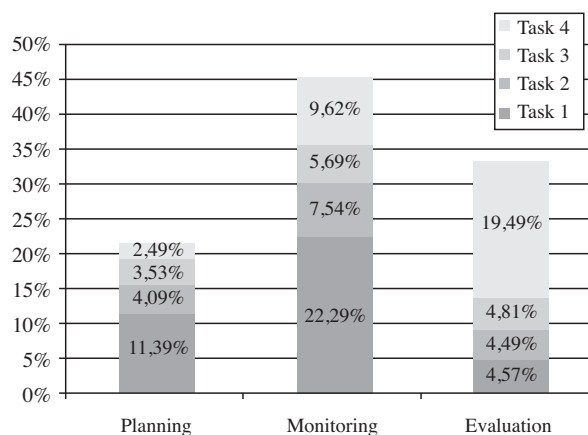

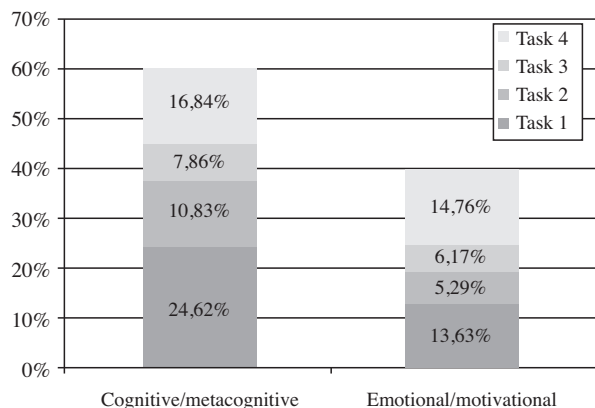*Figure 2. A synthesis of the detected indicators from the point of view of SRL phases*

Figure 3. A synthesis of the detected indicators from the point of view of SRL aspects

Figure 4. A synthesis of the detected indicators from the point of view of work organization

teacher aimed to encourage the trainees to become aware of their own bias; returning to express their own personal opinions aimed to increase their self-awareness; these data suggest that these expectations were fulfilled. The same ratio is revealed in Task 4. Comparing the data of Task 4 with those of Task 1, a changed attitude towards the importance of the two components emerge: both tasks involved the same playful context but Task 4 was much more cognitively loaded than Task 1; nevertheless in Task 1 there was a prevalence of cognitively/metacognitive indicators that does not appear in Task 4; the proportion between the two passing from almost double to almost equal. This is a strong indicator of a changed attitude and a point in favour of the suitability of the assigned tasks for this purpose.

Figure 4 presents a synthesis of the detected indicators from the point of view of individual and social organization. The prevalence of social indicators in Task 1, Task 2 and Task 3 is likely due to the nature of the assigned tasks, which were mainly collaborative. This is confirmed by the fact that in Task 4, whose nature was essentially individual, the individual component is stronger than the social one. In Task 2, the proportion between the individual component and the social one is lower than in Task 1 and Task 3, possibly due to the need to play a role, and hence explicitly express individual points of view and position. More in general, however, a low number of individual indicators does not necessarily mean that the trainees were not carrying out self-regulated actions at individual level, but possibly that they did not feel relevant communicating them.
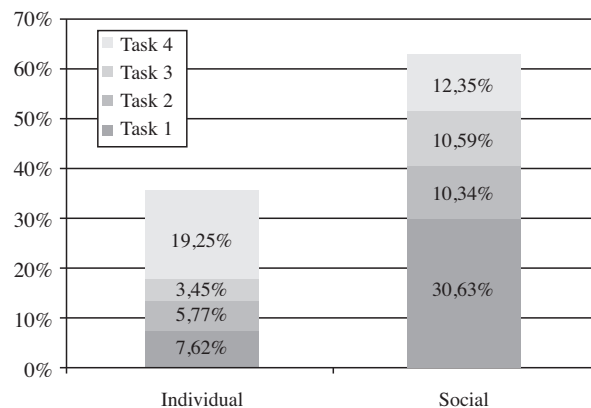
Discussion and conclusion

Pre-service teacher training is an area where SRL development is particularly important, not only because teachers' professional development heavily depends on their ability to control their own learning, but also because teachers' awareness of SRL dynamics is essential to promote the same competences in their students.

The literature on SRL tells us that these competences mostly develop gradually through practice, and to do so they must be consciously pursued by those who design instructional activities for teachers and by those who supervise them (Dettori et al, 2006). Among the criteria that informed the design and monitoring of the teacher training course discussed in this paper there was the need to pursue SRL development.

The considered case is particularly relevant because trainees' SRL competence is usually developed in relation with their own disciplines but often lacking two important components: practice with transferring competence in new contexts and ability to support their students' SRL development. In order to help them fill these gaps, it was important to guide them –both at individual and at social level– in the process of making SRL actions explicit.

The data presented suggest that the discussed course succeeded in this aim, in that SRL actions of various nature were often explicitly present in their discourses. Moreover, the balance between the various aspects and phases increased over time, which suggests a more balanced and mature SRL competence.

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