This research was aimed at highlighting the development of the idea of competence in the upper secondary schools. In particular, we wanted to stress the teaching strategies used by the teachers in the classroom in order to understand if the instructional actions are directed or not towards the development of competences. Inside this study, we underlined the role played by the web and the ICT in supporting such development. We involved 23 upper secondary schools with an unbiased stratified sample of teachers (N = 411) and students (N = 2893). The quantitative data analysis indicates that both teachers and students consider web and ICT as important factors in carrying out instructional actions. Instead, the qualitative analysis, shows that web and ICT are seen by the students as key elements for the development of competence, but only for their future outside the school.

KEYWORDS: Competence; ICT; web; upper secondary school.
1. Theoretical framework

The competence (Castoldi, 2011; Pellerey, 2004), has become a key aim for the instructional contexts in general and, in particular, for the upper secondary schools. Such purpose has to be achieved through challenging changes regarding mainly the teaching styles and the ways teachers manage the learning environment.

For this reason, in order to develop competence, teachers have to rethink both teaching and assessing strategies. This change can be attributed to a new paradigm (Castoldi, 2011) amending the idea of knowing and knowledge. From a methodological and organizational point of view, it is necessary to develop: situated, problematic and dialogic approaches (Rivoltella, 2013), collaborative work and critical and shared thinking.

ICT and, in particular, the diffusion of the mobile devices can help the development of learning environments oriented towards competence. Therefore, it would be necessary to promote the use of web and ICT at school in order to clarify the role of technologies in developing the competence through quantitative and qualitative studies.

First of all, it is necessary to reflect on the concept of literacy. This concept does not involve only the ability to read, write and calculate, but it includes all aspects which can promote the development of life skills for all pupils. These skills are needed in the society of knowledge (Ryken & Salgamik, 2007).

There are many literacies associated with the information and communication technology (Midoro, 2007; Ranieri, 2010): Information Technology Literacy, the know-how to choose and use technologies to obtain specific objectives (Levy & Murnane, 2001; Ryken & Salganik, 2007); the Information Literacy, the know-how to find, evaluate, select and manage information (ACRL, 2000; UNESCO, 2008); the Visual Literacy, the know-how to read and interpret visual images and content (Wileman, 1993; Benson, 1997; Branton, 1999); the Media Literacy, the know-how to analyse, understand and critically interpret media (Rivoltella, 2005; Buckingham, 2006, 2007); the Literacy network, the know-how to access in the network, to share knowledge and collaborate in the construction of new knowledge (Caviglia & Ferraris, 2008).

Therefore, the concept of literacy is a skill that includes several issues. Some of these concepts are specific of an instrument, other concepts are independent on the kind of technology (Ranieri, 2010).

In fact, these concepts include both technical-computing skills and critical thinking skills, problem solving, collaboration and inquiry. The result is a three-dimensional view (Calvani, Fini & Ranieri, 2011; Jenkins et al., 2009) of the concept of competence given by a complex combination of skills, abilities and knowledge.

Therefore, in order to pursue the development of competence, teachers should structure multidimensional learning environments. They should modify, in a systemic perspective, some learning environment aspects such as: the physical and contextual factors involved in the learning process (spatial and instrumental organization), the time spent, the objectives, how to achieve objectives (teaching strategies), the tasks and activities and, if necessary, tools and technological applications to use (Antonietti, 2003; Salomon, 1996).

In this way, the learning environment can be built through the combination
of different variables (Baldascino, 2008) directed toward specific student competences, such as: to look for and select significant information in hyper-information contexts; to identify and achieve objectives useful for various tasks; to find creative solutions through different strategies (e.g.: the best strategy for time spent, quality or resources used); to be able to communicate effectively; to express themselves, listen, compare with others, build, affirm or disprove the thesis through logic, conceptual frameworks and shared evaluation systems; to work with the group; to accept and debate ideas; to make decisions together and meet the commitments; to manage, direct and promote creativity; to translate ideas into action by evaluating the time spent, resources, opportunities and criticalities (Carletti & Varani, 2007; Cacciamani & Giannandrea, 2004).

2. Research design

2.1 The context and the research questions

This research was aimed at underlining the didactical situation in the Ligurian upper secondary schools. In particular, we wanted to highlight the teaching strategies carried out by the teachers in order to understand if the instructional actions are directed or not towards the development of competences.

Regarding this issue, the research question was:

1. what happens in the classroom? In particular, which teaching strategies are used by the teachers during the everyday classroom activities?

In order to reach this target, we collected quantitative data through the procedure explained in the following paragraphs.

In addition, we wanted to underline the ideas of the competence that teachers and students have developed. Regarding this issue, the research questions were:

2. what is the idea of competence of the students of the upper secondary schools?
3. what is the idea of competence of the teachers of the upper secondary schools?

In order to do so, we collected qualitative data through the procedure explained in the following paragraphs.

Included in such big questions, we investigated the role of ICT and web in developing learning environments oriented towards competence. This paper is focused on this topic.

2.2 The samples

Teacher sample

The research involved 23 upper secondary schools (with students aged from 14 to 19) of the region of Liguria. The teacher sample was composed of a group of teachers as indicated in table 1.
In order to create an unbiased stratified sample, we followed some precise steps:

1. we created a list of all upper secondary Ligurian schools, subdivided into three kinds of schools: senior high schools; technical schools and vocational schools;
2. we chose 23 schools at random among all Ligurian schools, selecting 7 senior high schools, 8 technical and 8 vocational ones, from four different regional areas (Imperia, Savona, Genova, La Spezia);
3. all teachers of each school filled in the questionnaire;
4. finally we chose at random the questionnaires to be considered for the sample, according to the percentages related to the two strata shown in table 2: kind of school and teaching area.

The teacher sample was composed of 71,8% of females and 22,2% of males. In addition we discovered that the teachers were divided into different ages and length of service, as shown in figure 1 and 2.
Student sample

The student sample was composed of a group of students as indicated in table 2.

<table>
<thead>
<tr>
<th>Kind of school</th>
<th>II</th>
<th>IV</th>
<th>total</th>
<th>% observed</th>
<th>% expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior high schools</td>
<td>658</td>
<td>588</td>
<td>1246</td>
<td>43,07</td>
<td>43,02</td>
</tr>
<tr>
<td>Technical school</td>
<td>495</td>
<td>450</td>
<td>945</td>
<td>32,66</td>
<td>32,84</td>
</tr>
<tr>
<td>Vocational school</td>
<td>424</td>
<td>278</td>
<td>702</td>
<td>24,27</td>
<td>24,14</td>
</tr>
</tbody>
</table>

| total                  | 1577| 1316| 2893  | 100,00     | 100,00     |

| % observed             | 54,51| 45,49|100,00 |
| % expected             | 54,51| 45,49|100,00 |

Table 2. Student sample

In order to create an unbiased stratified sample, we followed some precise steps:

1. we chose 4 second classes (students aged 15-16) and 4 fourth classes (students aged 17-18) at random in each of the 23 schools;
2. all students of those classes filled in the questionnaire;
3. finally we chose the questionnaires to be considered for the sample at random, according to the percentages related to the two strata shown in table 3: kind of school and student classes (II or IV).

The expected percentages were calculated on the basis of the official data delivered by the School Regional Office. We would like to underline that we could reach one out of seven Ligurian students and one out of seven Ligurian teachers. For these reasons, we can state that our sample is representative both of the student and teacher population of Ligurian schools.
2.3 Instruments and procedure

The structure of questionnaires

Two questionnaires were administered to teachers and students. The questionnaire for the teachers was composed of 84 closed-ended questions and 2 open-ended ones. All closed-ended questions were focused on the potential teaching strategies that teachers can use at school. In addition, they were split in two parts.

The former was focused on the agreement regarding the teaching strategy indicated by the item. A five-point Likert scale was used to register the responses and it ranged from ‘I totally disagree’ = 1, ‘I partially disagree’ = 2, ‘neither agree nor disagree’ = 3, ‘I partially agree’ = 4, ‘I totally agree’ = 5.

In the latter, the teachers were asked to indicate how many times they really use the strategy indicated by the question. In this case, a four-point Likert scale was used to register the responses and it ranged from ‘never’ = 1, ‘sometimes’ = 2, ‘often’ = 3, ‘always’ = 4.

The aim of the structure of this questionnaire was to highlight, on the one hand, the agreement and the idea of teachers about the different teaching strategies and, on the other hand, the real use of each strategy in the classroom.

Instead the questionnaire for the students was composed of 71 closed-ended questions and an open-ended one. All closed-ended questions were focused on the potential teaching strategies used by the teachers at school. As the previous questionnaire, they were split in two parts.

The former was focused on the agreement regarding the teaching strategy indicated by the item. A five-point Likert scale was used to register the responses and it ranged from ‘I totally disagree’ = 1, ‘I partially disagree’ = 2, ‘neither agree nor disagree’ = 3, ‘I partially agree’ = 4, ‘I totally agree’ = 5.

In the latter, the students were asked to indicate how many teachers of their classes really use the strategy indicated by the question. In this case, a four-point Likert scale was used to register the responses and it ranged from ‘none of my teachers’ = 1, ‘some of my teachers’ = 2, ‘many of my teachers’ = 3, ‘all my teachers’ = 4.

The aim of the structure of the questionnaire for the students was to compare the previous questionnaire results through the students’ view.

In the open-ended question, both teachers and students had to explain their idea of competence. In particular, the teachers had to answer the following questions:

- when do I understand that my students are competent? (question #62)
- when do I understand that my lessons have a positive effect on the students’ learning? (question #63)

Instead, the open-ended question for the students was:

- indicate an instructional situation carried out by your teachers, during which you felt yourself competent. Try to explain such a situation, saying in what way you felt competent (question #53).

As you can understand, the closed-ended questions were aimed at collecting the quantitative data in order to respond to the first research question. Instead,
the open-ended ones were aimed at collecting qualitative data in order to respond to the second and third research question.

**The questionnaire areas**

The questionnaires were structured in several areas focused on the different teaching strategies. The table 3 shows the questionnaires’ areas and sectors.

<table>
<thead>
<tr>
<th>area</th>
<th>sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching strategies</td>
<td>Lesson significance</td>
</tr>
<tr>
<td></td>
<td>Word use</td>
</tr>
<tr>
<td></td>
<td>ICT use</td>
</tr>
<tr>
<td></td>
<td>Time management</td>
</tr>
<tr>
<td></td>
<td>Lesson aims</td>
</tr>
<tr>
<td></td>
<td>Guided discussion</td>
</tr>
<tr>
<td></td>
<td>Group work</td>
</tr>
<tr>
<td></td>
<td>Role playing</td>
</tr>
<tr>
<td></td>
<td>Problem based learning</td>
</tr>
<tr>
<td></td>
<td>Educational contract</td>
</tr>
<tr>
<td></td>
<td>Concept maps</td>
</tr>
<tr>
<td>In the classroom</td>
<td>Use of space</td>
</tr>
<tr>
<td></td>
<td>Relationships</td>
</tr>
<tr>
<td></td>
<td>Competences</td>
</tr>
<tr>
<td></td>
<td>Planning methods</td>
</tr>
<tr>
<td>Assessment</td>
<td>Formative assessment</td>
</tr>
<tr>
<td></td>
<td>Assessment aims</td>
</tr>
<tr>
<td></td>
<td>Competence assessment</td>
</tr>
<tr>
<td></td>
<td>Assessment methods</td>
</tr>
<tr>
<td></td>
<td>Summative assessment</td>
</tr>
</tbody>
</table>

Table 3. Questionnaire areas

The questionnaires were administered online through the software Limesurvey. The teachers could fill in the questionnaire autonomously, whereas the students filled in the questionnaire in the computer lab of each school, led by a member of the research team.

**The focus-group**

In order to collect further significant qualitative data about the competence idea, we carried out 46 focus groups also, 2 for each school involved: one with second class students and one with fourth class students. We chose 8 students at random from all second classes and 8 students from all fourth classes of each school.

The leading questions are as follows:

- In your class, do your teachers use teaching strategies focused more on the theory or the practice?
– What does it mean to be competent?
– Will the knowledge and the skills that you learn at school be useful outside the school?
– Will the knowledge and the skills that you learn at school be useful in the labour market?
– Regarding what you have said so far, what should your teachers do?

Those questions were directed to debate and clarify even further the ideas of competence of students but they are not connected to the topic of this paper.

3. Data analysis

3.1 Quantitative data

The quantitative data were analysed with the software Spss. In this paper, we want to point out to the questions related to the sector ‘ICT use’ included in the area named ‘Teaching strategies’. The teacher questionnaire included the following two questions:
– #17: during the school year, I use ICT to manage my lessons
– #18: during the school year, I use the web to manage my lessons

![Figure 3. Frequencies of the questions on the use of ICT and web (teacher questionnaire)](image)

As you can see, ICT are used ‘often’ and ‘always’ by 41,19% of teachers whereas 23,82% of teachers use the web for their lessons. We can state the a large number of teachers use ICT but few teachers use the web.

Those data are only partially confirmed by the students. In fact, only 10,88% of the students indicate that ‘many’ or ‘all of their teachers’ use ICT and 8,73% of the students indicate that their teachers use the web during the lessons.
It is important to underline that 83.63% of teachers agree (‘totally’ or ‘partially’) on the use of ICT in the classroom (M = 4.19; SD = .772) and 69.63% agree on the use of the web (M = 3.82; SD = .918).

Likewise, 81.34% of students agree on the use of ICT (M = 4.24; SD = .966) and 77.18% agree on the use of web in the classroom (M = 4.09; SD = 1.1).
Examining the differences between the schools through the analysis of teacher questionnaire, we can point out a significant difference between the vocational and the senior high schools for the question #18 (use of the web). The chi square (13, 64, df = 3, p<.005) indicates that vocational school teachers use the web more during their lessons compared to the colleagues of the senior high schools. Likewise, the chi square (18, 8, df = 3, p<.005) shows that technical school teachers use the web more compared to the colleagues of the senior high schools.

These data are confirmed by ANOVA analysis that indicates a value of $F_{(2,400)} = 10.34$ with $p < .001$. The post-hoc analysis conducted with Bonferroni method specifies that the difference between senior high schools ($M = 1.84$) and vocational ones ($M = 2.13$) is significant ($287^*, p < .05$). As for the difference between senior high and technical schools ($M = 2.22; .372^*, p < .05$).

In addition, we can observe that the level of the occurrences for high rates ($3 = \text{‘often’}$ and $4 = \text{‘always’}$) for the use of the web (question #18) are concentrated in the technical (46.87%) and vocational (30.21%) schools compared to the percentage for the senior high schools (22.92%). We must consider that the expected percentage should be similar to the sample: 40.94% for the senior high schools; 34.86% for the technical schools and 24.20% for the vocational schools. These data indicate that the web is mostly used in the technical and vocational schools, even if included in an overall situation where the use of the web is generally low.

### 3.2 Qualitative data

On the one hand, the quantitative data indicate the agreement on the use of web and ICT as teaching strategies and, on the other hand, the real use in the everyday classroom activities.

Instead, the qualitative data allow us to focus our attention on role played by web and ICT in developing the idea of competence by teachers and students. The qualitative data arise from the analysis of the texts written by the students in answering to the open-ended question #53 (questionnaire for students) and by the teachers for the questions #62 and #63 (questionnaire for teachers). The data have been analysed with the software T-LAB.

First of all, we found many references to web and ICT in the students’ responses whereas the teachers used such words very little. The words ‘technology’ and ‘computer’ do not appear while ‘Internet’ is quoted only in the responses of three teachers (in both questions). For these reasons, we focus our attention on the analysis of student responses.

Our analysis focuses on three reference words: ‘technology’, ‘internet’ and ‘computer’. Our aim is to highlight the relationships of these terms with the ideas of learning and competence. In particular, the word ‘technology’ can be represented by two groups of words: the core ‘future-building-competence-applying’ and the peripheral group, distant and contrasted, ‘class-lesson-participation-teaching-teacher-experience’. The two different groups show the distance between the students’ expectations for the competence development and the real application in the classroom.

A student wrote: “I understood everything during a lesson with technology because the topic was interesting and I wasn’t worried about the assessment”.
The analysis of the association of the second word ‘internet’ highlights the two different possible conceptions of the web: a tool to use to look for information (using-inquiry-information-culture) and an opportunity to reflect and think about the future (debating-talking-participation-world-of-work-designing-computer).

A student said: “I felt competent during a lesson of history. We had to use internet to look for significant information”. Another student quoted: “When we talk about the theatre, I feel competent because it’s my passion. I look for information about it with internet”. Another student: “Our English teacher told us to carry out inquiries using internet. I felt competent and proud because I could present the results to my schoolmates”.

**Figure 7. Radialgraph of word ‘technology’**

<table>
<thead>
<tr>
<th>LEMMA</th>
<th>COEFF</th>
<th>C.E.(A)</th>
<th>C.E.(AB)</th>
<th>CHI²</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUILDING</td>
<td>0.16</td>
<td>52</td>
<td>4</td>
<td>54.524</td>
</tr>
<tr>
<td>FUTURE</td>
<td>0.096</td>
<td>36</td>
<td>2</td>
<td>18.509</td>
</tr>
<tr>
<td>APPLYING</td>
<td>0.081</td>
<td>51</td>
<td>2</td>
<td>12.074</td>
</tr>
<tr>
<td>DESIGNING</td>
<td>0.061</td>
<td>91</td>
<td>2</td>
<td>5.378</td>
</tr>
<tr>
<td>EXPERIMENT</td>
<td>0.058</td>
<td>100</td>
<td>2</td>
<td>4.627</td>
</tr>
<tr>
<td>COMPETENCES</td>
<td>0.056</td>
<td>106</td>
<td>2</td>
<td>4.201</td>
</tr>
<tr>
<td>SKILLS</td>
<td>0.052</td>
<td>123</td>
<td>2</td>
<td>3.231</td>
</tr>
<tr>
<td>NEED</td>
<td>0.047</td>
<td>37</td>
<td>1</td>
<td>3.602</td>
</tr>
</tbody>
</table>
The third focus is the word ‘computer’. This term shows a direct association with the labour market and the ability to ‘feel competent’, whereas it remains detached from school contexts, teacher and learning.

Some students said: “I felt competent when we used the computer. I was able to carry out inquiries and presentations”; “I felt competent when we carried out group activities around the computer because we had to reason and explain our ideas and opinions”.

<table>
<thead>
<tr>
<th>LEMMA</th>
<th>COEFF</th>
<th>C.E.(A)</th>
<th>C.E.(AB)</th>
<th>CHI²</th>
</tr>
</thead>
<tbody>
<tr>
<td>USING</td>
<td>0.205</td>
<td>102</td>
<td>8</td>
<td>88.15</td>
</tr>
<tr>
<td>INQUIRY</td>
<td>0.134</td>
<td>59</td>
<td>4</td>
<td>36.368</td>
</tr>
<tr>
<td>INFORMING</td>
<td>0.125</td>
<td>68</td>
<td>4</td>
<td>30.691</td>
</tr>
<tr>
<td>CULTURE</td>
<td>0.113</td>
<td>21</td>
<td>2</td>
<td>26.644</td>
</tr>
<tr>
<td>DETAILED STUDYING</td>
<td>0.102</td>
<td>103</td>
<td>4</td>
<td>18.102</td>
</tr>
<tr>
<td>CLASS</td>
<td>0.093</td>
<td>494</td>
<td>8</td>
<td>9.666</td>
</tr>
<tr>
<td>ASKING</td>
<td>0.092</td>
<td>198</td>
<td>5</td>
<td>12.31</td>
</tr>
<tr>
<td>COMPETENT</td>
<td>0.089</td>
<td>1220</td>
<td>12</td>
<td>4.924</td>
</tr>
<tr>
<td>LESSON</td>
<td>0.087</td>
<td>1074</td>
<td>11</td>
<td>4.789</td>
</tr>
<tr>
<td>EXPLAINING</td>
<td>0.086</td>
<td>143</td>
<td>4</td>
<td>11.342</td>
</tr>
<tr>
<td>TASK</td>
<td>0.077</td>
<td>100</td>
<td>3</td>
<td>9.308</td>
</tr>
<tr>
<td>TEACHER</td>
<td>0.077</td>
<td>1120</td>
<td>10</td>
<td>2.286</td>
</tr>
<tr>
<td>BUILDING</td>
<td>0.072</td>
<td>52</td>
<td>2</td>
<td>8.734</td>
</tr>
<tr>
<td>FINDING OUT</td>
<td>0.072</td>
<td>13</td>
<td>1</td>
<td>10.363</td>
</tr>
<tr>
<td>CLARIFYING</td>
<td>0.071</td>
<td>53</td>
<td>2</td>
<td>8.508</td>
</tr>
<tr>
<td>TALKING</td>
<td>0.069</td>
<td>223</td>
<td>4</td>
<td>5.279</td>
</tr>
<tr>
<td>ASSESSING</td>
<td>0.069</td>
<td>127</td>
<td>3</td>
<td>6.385</td>
</tr>
<tr>
<td>CONCEPT</td>
<td>0.068</td>
<td>57</td>
<td>2</td>
<td>7.685</td>
</tr>
</tbody>
</table>

Figure 8. Radialgraph of word ‘internet’
4. Discussion and conclusion

We must underline some key points after the data analysis in order to explain the relationship between web, ICT and the development of the idea of competence perceived by teachers and students.

From a quantitative point of view, both teachers and students consider ICT as an important factor to carry out meaningful lessons in the classroom but teachers quote a bigger use whereas few students declare that ‘some of their teachers’ use ICT in the classroom: why can we find such difference? Probably, some
teachers use ICT in directive ways (presenting data or showing pictures) so stu-
dents see these lessons as “verbal” even if teachers use ICT.

The web is considered and used a little bit less than ICT by the teachers in-
stead the students would use it more frequently; probably the teachers have so-
me difficulties in managing lessons with internet both from a technical point of
view (lack of wifi connection) and from a didactical perspective.

The most important issue is as follows: why would teachers like to use ICT
and web during their lessons but they cannot? The answers might be several:
lack of devices; lack of flexibility of the school organization (time spent and space
in particular); lack of technological skills by the teachers.

The key consequence is the lack of relationship between web and ICT and
the development of competence. In fact, the qualitative data underline that the
words ‘technology’ and ‘computer’ are close to the idea of competence, explai-
ned by the terms like ‘future’, ‘building’, ‘applying’, ‘labour market’ but, unfortu-
nately, they are still badly related to the world of school.

Curiously, the word ‘internet’ is seen by the students as a tool to look for use-
ful (or interesting) information but it is not correlated either with the world of
school or with the labour market.

In any case, the most important issue is how to connect the use of web and
ICT with the competence in a meaningful way. This research indicates that the
simple use of tools or devices is not enough to clarify to the students the role of
web and ICT in developing their competences. It is necessary:

– to apply the informal student inquiry skills inside the instructional expe-
riences carried out at school in order to plan activities connected to the re-
al world;
– to allow students to create multimedia artifacts with various kinds of devi-
ces;
– to start from problem situations but to structure consistent and situated
knowledge and skills.

Summarizing, technology has to be ‘embedded’ in the educational actions
because, in this way, students can catch the sense of the competence connected
to the use of web and ICT. Otherwise, technology is seen only like a tool to do
something.

At the moment, the most suitable strategy seems the episodes of situated
learning (Rivoltella, 2013). Such a teaching method allows teachers to focus their
attention on the learning environment where web and ICT play the role of en-
hancing the students’ skills in managing information, building an multimedia ar-
tifact that can present their ideas, debating about the findings of their inquiries.
In addition, this method is quick enough to allow teachers to identify the pros
and cons of the instructional actions through frequent feed-back. So they are
able to modify, assess and implement their own lesson plans.

Ultimately, web and ICT can become key factors for the development of the
competences if technology acts inside the learning environment, in order to meet
the student informal competences with the formal paths of school learning,
through a correct use of the mobile devices. In this way, the knowledge of a spe-
cific subject can dialogue with the transversal competences, resulting in competen-
tces for the labour market and the life.
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