

Tommasi, Francesco; Ceschi, Andrea; Bollarino, Sara; Belotto, Silvia; Genero, Silvia; Sartori, Riccardo  
**Enhancing critical thinking skills and media literacy in initial VET students: a mixed methods study on a cross-country training program**

*International journal for research in vocational education and training* 10 (2023) 2, S. 239-257



Quellenangabe/ Reference:

Tommasi, Francesco; Ceschi, Andrea; Bollarino, Sara; Belotto, Silvia; Genero, Silvia; Sartori, Riccardo:  
Enhancing critical thinking skills and media literacy in initial VET students: a mixed methods study on a  
cross-country training program - In: *International journal for research in vocational education and training*  
10 (2023) 2, S. 239-257 - URN: urn:nbn:de:0111-pedocs-269656 - DOI: 10.25656/01:26965;  
10.13152/IJRVET.10.2.5

<https://doi.org/10.25656/01:26965>

in Kooperation mit / in cooperation with:



<http://www.ijrvet.net>

#### Nutzungsbedingungen

Dieses Dokument steht unter folgender Creative Commons-Lizenz:  
<http://creativecommons.org/licenses/by-nc-nd/4.0/deed.de> - Sie dürfen das  
Werk bzw. den Inhalt unter folgenden Bedingungen vervielfältigen, verbreiten  
und öffentlich zugänglich machen: Sie müssen den Namen des  
Autors/Rechteinhabers in der von ihm festgelegten Weise nennen. Dieses  
Werk bzw. dieser Inhalt darf nicht für kommerzielle Zwecke verwendet  
werden und es darf nicht bearbeitet, abgewandelt oder in anderer Weise  
verändert werden.

Mit der Verwendung dieses Dokuments erkennen Sie die  
Nutzungsbedingungen an.

#### Terms of use

This document is published under following Creative Commons-License:  
<http://creativecommons.org/licenses/by-nc-nd/4.0/deed.en> - You may copy,  
distribute and transmit, adapt or exhibit the work in the public as long as you  
attribute the work in the manner specified by the author or licensor. You are  
not allowed to make commercial use of the work or its contents. You are not  
allowed to alter, transform, or change this work in any other way.

By using this particular document, you accept the above-stated conditions of  
use.



#### Kontakt / Contact:

peDOCS  
DIPF | Leibniz-Institut für Bildungsforschung und Bildungsinformation  
Informationszentrum (IZ) Bildung  
E-Mail: [pedocs@dipf.de](mailto:pedocs@dipf.de)  
Internet: [www.pedocs.de](http://www.pedocs.de)

Mitglied der

  
Leibniz-Gemeinschaft

# Enhancing Critical Thinking Skills and Media Literacy in Initial VET Students: A Mixed Methods Study on a Cross-Country Training Program

Francesco Tommasi<sup>\*1</sup>, Andrea Ceschi<sup>1</sup>, Sara Bollarino<sup>2</sup>, Silvia Belotto<sup>2</sup>,  
Silvia Genero<sup>2</sup>, Riccardo Sartori<sup>1</sup>

<sup>1</sup>*Department of Human Sciences, University of Verona, Lungadige Porta Vittoria, 17,  
37129, Verona, Italy*

<sup>2</sup>*ENAIIP Veneto Foundation, Via Ansuino da Forlì, 64, 35134, Padova, Italy*

Received: 21 December 2022, Accepted: 12 June 2023

## Abstract

**Context:** In the last few decades, the constant and exponential changes in the society's consumption of information have increased the awareness of practitioners from the education and training field, on the need for training programs for the enhancement of critical thinking skills and media literacy among students from Initial Vocational Education and Training (IVET) who are less exposed to intellectual trainings than their peers in traditional education pathways.

**Approach:** With this impetus, the present paper reports the results of a mixed methods study evaluating a training program for such competences. Based on a cognitive psychology theoretical framework, the training program consisted in three main techniques through which trainers can work with students in the classroom.  $N= 35$  trainers from five different countries (i.e., Greece, Italy, Spain, Portugal, and the Netherlands) were instructed about the training techniques and implemented them in their training centres. Then, a total of  $N= 288$  students among these countries were involved in the testing of the training, which took place on a duration average of 5 months. Mixed methods approach was used to evaluate the effectiveness and quality of the training. Notably, prospective statistical analysis

---

\*Corresponding author: francesco.tommasi@univr.it



evaluated the training's impact of the participating students and compared with a control group. Qualitative interviews examined the training's lived experience with a group of students and trainers.

**Findings:** The quantitative and qualitative analysis of pre/post- measures of critical thinking skills and media literacy of the experimental group, and the comparison with the control group, indicate an increase in these competences and confirm the efficacy of the training intervention.

**Conclusion:** These results inform about the usefulness of the training program cross-culturally and the feasibility of training strategies based on cognitive psychology. Moreover, the paper offers a methodological contribution thanks to the proposition of the mixed methods approach for training programs assessment.

**Keywords:** Critical Thinking Skills, Social Media, Educational Program, Qualitative Research, Quantitative Research, VET, Vocational Education and Training

## 1 Introduction

Given the constant and exponential changes of information and technology, scholars and practitioners have highlighted the imperative for finding practices devoted to the promotion of critical thinking skills and media literacy in the context of Initial Vocational Education and Training (IVET) (Bolaños & Salinas, 2021; Candido et al., 2023; Fraillon et al., 2014; Hague & Payton 2011). This emphasis stands in the context of IVET since intellectual disciplines and educational opportunities for critical engagement are less prominent (European Commission, 2020; Perini et al., 2022; Riesmeyer et al., 2016; Tommasi et al., 2022). The core part of the IVET is the focus on the application of technical and practical modules to prepare students for the labour market which reduces the occasion to foster intellectual opportunities (European Commission, 2020; Perini et al., 2022; Riesmeyer et al., 2016; Sartori et al., 2022; Tommasi et al., 2023). IVET teachers and trainers operate in the absence of formal ways of approaching such skills with unclear expectations about appropriate programs.

Recent reviews of the scientific literature presented the lack of a consensus on the definition of critical thinking skills and media literacy and how to address these dimensions in the context of IVET (see Tommasi et al., 2023). The absence of shared approaches and institutional guides leaves to the own responsibility of trainers, teachers, and Vocational Education and Training (VET) centres the promotion of such skills. Ultimately, the question on how IVET teachers and trainers can find a guide for educational actions to foster critical thinking skills and media literacy remains unanswered (European Commission, 2020; Riesmeyer et al., 2016; Sartori et al., 2022; Tommasi et al., 2023).

The overarching aim of the present study is to take into account this gap on how to promote critical thinking skills and media literacy in the context of IVET. To pursue this aim, the study used a mixed methods approach to evaluate and examine a novel designed program of training for enhancing critical thinking skills and media literacy in IVET students. The designed program focused on training for supporting IVET students in behaving critically followed recent advance in cognitive psychology. It has been realized by the NERDVET project (*Think smart! Enhancing critical thinking skills and media literacy in VET*, n.d.), an Erasmus+ KA3 project co-funded by the European Commission, a cross-country project involving allied VET centres from Greece, Italy, Portugal, Spain, and The Netherlands. This project had the proposition of developing a novel educational program to support VET teaching staff in increasing critical thinking skills and media literacy of their students.

In more details, the NERDVET educational program bases on different training techniques and follows the cognitive psychology notion of self-nudging as a theoretical framework. Applying a cognitive psychology approach, teachers and trainers implemented techniques focused on (a) fostering the use of reliable sources, (b) reducing irrational beliefs and cognitive biases, and (c) proactive behaviours (Hertwig & Grüne-Yanoff, 2017; Kenyon, 2014; Noorani et al., 2019; Soll et al., 2014). According to the notion of self-nudging, teachers and trainers are active actors in fostering students' capacity to create a set of specific personal strategies to reach a target or to tailor their behaviour for a proactive purpose (Thaler & Sunstein, 2008; Torma et al., 2018), e.g., using reliable sources, reducing the reference to irrational beliefs, and being proactive in behaving critically in their daily life. Training programs based on self-nudging are meant to foster proactive commitment of individuals in the processing of information, supporting the creation of specific individuals' strategies to critically evaluate information and adopt a specific behaviour (Sartori et al., 2022).

In the present paper, we begin presenting the designed actions of the NERDVET partnership and the training program. Five groups of teachers and trainers from five different countries participating to the NERDVET project (Greece, Italy, Spain, Portugal, and The Netherlands) worked together to test a set of techniques and practical exercises for enhancing critical thinking skills and media literacy. Second, we continue reporting the number of participants involved in the training program, i.e., teachers and trainers, and students of each involved country of the project. Here, we present the mixed methods approach, i.e., quantitative and qualitative approaches, used for examining the quality the programs. Third, we report the results of our examinations. Prospective statistical analysis offers evidence of the efficacy of the training in promoting the critical thinking skills and media literacy. Prospective analysis of interviews offers indications of the experiences and perceptions of the training. We conclude discussing our results offering indications for theory and practice.

## 2 Method

In the present study, we evaluated a training program for supporting IVET students in behaving critically. The training program followed recent advance in cognitive psychology, and it has been realized by the NERDVET project. For the assessment of the effectiveness of the training, we used a mixed methods approach

### 2.1 Training Program

The training program refers to a shared definition of critical thinking skills and media literacy resulting from a cognitive psychology framework. That is, critical thinking skills include:

*"metacognitive competence concerning abilities of reflection, analysis and questioning of information resulting in proactive behaviour and citizenship. [...] media literacy as the equivalent of media information literacy, where the alphabet and language used are media content. Media literacy encompasses the knowledge and skills to think critically about media information through an understanding of media representations, structures and implications." (Tommasi et al., 2023; p. 16).*

Thus, approaching critical thinking and media literacy from a cognitive psychology perspective, focusing on how individuals analyse and understand information and concepts, including those coming from digital media, implies helping them creating connections between concepts, break down information and rebuild it with logical connections, as – in doing so – their understanding of that information/concept will increase. By transferring these concepts to the educational context, a range of training objectives are ultimately defined: 1) Supporting the use of procedures to detect misinformation; 2) Enhancing the awareness of cognitive biases; 3) Enhancing the individuals' ability to develop personal strategies and procedures to process information objectively and behaving critically in a digital environment (Hertwig & Grüne-Yanoff, 2017; Kenyon, 2014; Noorani et al., 2019; Soll et al., 2014). By coupling these cognitive aspects with the previously mentioned factors related to the development of critical thinking in IVET, the following three educational techniques have been at the core of the training program tested: (a) Debunking misinformation by using reliable sources; (b) Raising awareness on biases, irrational beliefs and heuristics; (c) Self-nudging (Sartori et al., 2022; Thaler & Sunstein, 2008; Torma et al., 2018).

The training program began with a train the trainer session with a training meant to teach the three techniques above presented to teachers and trainers. This occurred in different online sessions during which Francesco Tommasi and Andrea Ceschi taught teachers and trainers in an interactive modality. Then, participants of the train the trainer session developed a series of training strategies and then trained themselves in their use and application. In parallel to the rules set as common ground, trainers were still granted a degree of freedom to

decide how to transfer the contents of the training program to their students. Furthermore, the proposed exercises and strategies were adapted for the training program in each country, especially in terms of simplification or the use of classroom content in a customised form. Some group of teachers and trainers have additionally found ways to thematically modify them to integrate them in the topics of the lessons. Moreover, other cases of teachers creating their own exercises, taking inspiration from the training techniques, or translating them in their national languages to foster efficacy were registered. In addition, five video animations were available for teachers' use. These video tutorials unanimously proved to be useful tools to expose topics and ideas for discussion, present visual stimuli to accompany the exercises, as well as to allow brainstorming and debate.

Then, the training programs for each country took place in a timeframe that ranged from three to seven months, average duration of five. Vocational education and training providers have been able to arrange their training phases by frequency and length of the training, according to the needs of their students and to the trainers' work programmes. With respect to the participation of teachers and trainers, they volunteered to take part and to involve their students. 35 trainers (age range 24 to 50 years old) volunteered to take part in the training program and included  $N = 288$  students (age range 15 to 31 years old) which were randomly identified in each VET centre. Simultaneously, each vocational education and training provider established one control group, for a total of  $N = 173$  learners, with the aim to compare the impact of the training on the experimental group (see Table 1).

With respect to the duration, the training program followed different time frames according to differences in terms of a) duration of the educational programs, b) national and regional holidays, and c) duration of the school year. Specifically, The Netherlands IVET centre took three months (February – April 2022), in Greece took three months (March – May 2022), in Spain four months (March – June 2022), in Italy five months (February – June 2022), and in Portugal seven months.

*Table 1: Descriptive Data of the Study Participants per Each Country*

Country	Trainers	Students	Control Studens
Greece	8	30	10
Italy	8	105	39
Portugal	6	82	73
Spain	6	30	7
The Netherlands	7	33	23

## **2.2 Assessment of the Training Program: Mixed Methods Approach**

We used a mixed methods approach for purposes of (a) expansion (extending breadth and scope) to allow exploration of multiple levels of influence and (b) triangulation to assess the extent to which qualitative and quantitative findings corroborate each other (Caves & Oswald-Egg, 2023; Morse, 2016; Shorten & Smith, 2017). We used a quantitatively and qualitatively driven approach meant to supplement each other. Quantitative part was theoretical drive and so deductive. In this case, self-report measures (described below) have been used to assess pre/post- training program the level of critical thinking skills and media literacy. Data collected are then analysed in order to find evidence of significant differences between two time points (time 1, pre-training vs time 2, post-training), and two groups (1 control group without training and 1 experimental group of people who participated in the program). Qualitative part was inductive as meant to examine the experiences and perceptions of teachers and trainers, and students who participated in the training program. Data collected are then analysed to explore the lived experience and find indications for the improvement of the training, as well as to expand the knowledge on the factors contributing to the enhancement of critical thinking skills and media literacy. Quantitative and qualitative data were collected concurrently, analysed independently, then merged and integrated to create the research narrative (Morse & Neihaus, 2009).

Before data collection, participants were informed about the aim of the study who then provided their consent to the use of the data collected. The study has been approved by the ethical committee of the University of Verona (n. 2022-45b) according to the declaration of Helsinki.

### **2.2.1 Quantitative Assessment**

We constructed an online survey protocol comprising two scales and demographics. Using the online survey software LimeSurvey, students of the VET centres were invited to participate via teachers and trainers before and after the training involving both participants of the training and a control group of students of the same age and classes. The survey took between five and seven minutes for them filling in it. Analyses have been conducted using SPSS (version 22). We used a self-evaluation tool to allow teachers and trainers to verify which is their level of critical thinking skills and media literacy, whether there is room for improvement and whether the learning activities carried out during the training were effective. Results can then be easily interpreted by looking at the range of the answers. Particularly, we used the California Critical Thinking Scale developed by Facione, and Giancarlo in 1998, and adapted to Dutch, Greek, Italian, Spanish and Portuguese. It contests in 27 items on a five-point Likert-type scale (1 = Strongly Disagree to 5 = Strong Agree) and the internal consistency coefficient of the scale was 0.88.



The other assessment tool employed was the Self-Nudging Scale, which has been developed for the present study. It is a seven-point Likert scale consisting of nine different but connected behavioural-cognitive dimensions for 27 items related to self-nudging for behaving critical, namely a) managing information (3 items), b) simplifying information, c) reframing alternative information (3 items), d) behaving critical explicitly (3 items), e) social influence (3 items), d) using alternative strategies, f) managing data (3 items), g) using self-incentives (3 items), h) emotional affections (3 items), and i) using self-reminders (3 items) (reliability of each scale ranged from .80 to .91).

After the first data collection, we operated on time fatigue and efforts of students, and the scale was reduced from 64 items to 54 by cutting the number of items of the California Critical Thinking Scale ( $n = 7$  items) and the Self-nudging scale (eliminating the scale "using self-incentives").

Then, we conducted a Confirmatory factor analysis (CFA) to examine the factor structure of the Self-Nudging Scale as a means to verify the reliability of the measure. To do so, we tested the scale with separate factors which led to a good model fit ( $\chi^2(224) = 492$ ,  $p < 0.001$ , SRMR = 0.06, RMSEA = 0.062, CFI = 0.95) and in line with recommended cut-off scores (CFI  $\geq 0.95$ ; SRMR  $\leq 0.06$ ; RMSEA  $\leq 0.08$ , e.g., Hu & Bentler, 1999). No error terms were allowed to correlate.

### 2.2.2 Qualitative Assessment

We devised a field study by involving a mix of qualitative data collection and analysis methods; coupling semi-structured interviews with the grounded theory approach (Charmaz, 2008; Glaser et al., 1968). On the one hand, qualitative data collection has been considered to conduct an exploratory investigation from the standpoint of the experiences and views of the participants. On the other hand, the grounded theory approach allowed us to generate new knowledge by valuing the experiences and narratives of participants. This method has been used in similar research contexts (Tacconi, 2011; Tacconi & Morbioli, 2019) since it also helps considering unexpected elements that may occur in qualitative data.

We collected data via semi-structured interviews to keep the focus on the research object, without a strict structure of questions. As such, this method helped to let participants tell and present their opinions and link episodes and situations that may be relevant for them. Following the principles of grounded theory, the starting reference track, was fixed after each interview with the aim of better investigating the perspectives and experiences reported by the subjects involved (Charmaz, 2008). For students, the semi-structured interview involved open questions meant to foster engagement in the participation to the interview. For example, we started with questions on their experience and perception of the training "How was the training?" "Have you learnt anything?". Then, we continued following participants



answers and focused on aspects of the training and their experience, an example of our questions is "Do you have a particular experience that you would like to share?", "Did you find any difficulties in following the activities of the trainers?". In this, we also asked participants to talk about their acquired knowledge and how they evaluated the training in qualitative terms "Have you applied what you learnt out of the school?", "Did you find the activities useful for you?". In closing, we asked whether they wanted to advance suggestions about the training program.

For teachers and trainers, we used a similar semi-structured interview. We began with open questions on their experience of the training, i.e., "How was the training? Did you enjoy it?". We continued talking about their experience in the classroom, asking the participants about particular meaningful and/or negative stories of their training implementation. In closing, we left teachers and trainers to talk about their perception of the value of the training by asking "Is there anything you would like to add to this interview?", "Do you have additional comments about the training?". In these terms, we tried to make the participants to feel free as much as possible to share their comments and views of the training.

Participants were invited via email, i.e., brief description of the study accompanied the invitation. A total amount of 14 students and trainers were involved in the study. The interviews were conducted electronically via Zoom according to the interview's possibilities (average interview time,  $M = 35$  minutes, standard deviation 10.23).

### **2.2.3 Data Analytic Plan**

Interviews were audio-recorded and then transcribed at the end of the data collection. For anonymity concerns and analysis purposes, a progressive code to each conversational turn of the word has been assigned to make each extract traceable. Quantitative data were analysed with independent  $t$ -test and paired-sample  $t$ -test in order to verify the alternative-hypothesis of significant differences in pre/post training and for the comparison between the control and experimental group.

For anonymity concerns and analysis purposes, a progressive code to each conversational turn of the word has been assigned to make each extract traceable. For example, the code [INT004/03] indicates the interviewee number INT04 in the/03 turn of the interview. In the end, data were analysed according to the guidelines of grounded theory. Sets of information were grouped into categories and sub-categories to systematize the interviewees' contributions to the research focus. The use of codes allowed a continuous analysis and re-categorization of the original interview texts and providing the sketching of a model anchored to the data on which it was built. Such a procedure has been administered manually.

### 3 Results

Analysis of quantitative and qualitative data revealed interesting results about the training program. For clarity and convenience, we report them in separate sections (i.e., 3.1 and 3.2) and we narratively combine them in the discussion.

#### 3.1 Quantitative Part

With respect to the quantitative part of the assessment, we firstly run descriptive statistics of the involved groups. Table 2 reports the descriptive statistics for each country at time 1 and time 2 of data collection.

Table 2: Samples Descriptions at Time 1 and Time 2 of Data Collection

	Time 1					Time 2				
	Group		Gender		Age	Group		Gender		Age
	Exp.	Control	Male	Female		Exp.	Control	Male	Female	
Greece	12	/	12	/	21	48	9	29	28	20
Italy	114	17	113	18	17.2	114	17	113	16	17.2
Portugal	37	39	26	50	17.3	71	58	33	96	28.5
Spain	15	11	26	/	18.3	15	11	26	/	18
The Netherlands	50	16	56	9	18.2	50	16	23	3	18.2

We firstly tested the hypothesis assuming significant higher levels of critical thinking skills and media literacy within the experimental group of students at the end of the training, i.e., pre-post comparison, using paired-sample *t*-tests. Secondly, we tested the comparison between the experimental group and the control group for each country via independent-sample *t*-test. We made pre/post- and experimental *vs* control group comparisons for the variable California Critical Thinking Scale and the Self-nudging dimensions ( $N = 8$ ).

In respect to the first group of hypotheses, first, students from Greece reported an improvement for the general level of critical thinking ( $t(11) = 4.58, p = .001$ ), plus improvements for the dimensions of self-nudging linked with the behavioural strategies and the management of information in a critical modality. Particularly, students reported higher levels of reframing alternative information ( $t(10) = 2.34, p = .042$ ), behaving critical explicitly ( $t(10) = 2.89, p = .02$ ), social influence ( $t(10) = 3.49, p = .01$ ) and managing information ( $t(10) = 2.3, p = .04$ ). Second, students from The Netherlands showed higher levels for all the dimensions of critical thinking and self-nudging scale except for the dimension of reframing alternative with a *p*-value slightly higher than the cut-off of  $p < .05$ . Third, students from Italy reported improvements as well. Participants of the training program resulted to have

higher levels of critical thinking ( $t(98) = 2.85, p = .001$ ), and the self-nudging dimension of simplifying information ( $t(95) = 1.95, p = .03$ ), b) social influence ( $t(94) = 2.34, p = .01$ ), managing data ( $t(94) = 2.96, p = .002$ ), and emotional affections ( $t(94) = 2.86, p = .003$ ). Fourth, students from Portugal reported to have similar results with higher levels of critical thinking ( $t(36) = .43, p = .001$ ), and self-nudging dimensions of simplifying information ( $t(30) = 3.19, p = .003$ ), social influence ( $t(29) = 1.97, p = .05$ ), using alternative strategies ( $t(29) = 5.05, p = .001$ ), managing data ( $t(29) = 2.56, p = .02$ ) and emotional affections ( $t(29) = 2.23, p = .03$ ). Lastly, students from Spain showed improvements in critical thinking ( $t(14) = 1.75, p = .004$ ), and managing information ( $t(13) = 1.77, p = .05$ ), simplifying information ( $t(13) = 1.35, p = .03$ ), and reframing alternative information ( $t(13) = 1.03, p = .02$ ) for self-nudging.

Such improvements are related to the fact that students attended the training, because the comparison with control group reveals that participants of the training program had higher levels of critical thinking and media literacy when compared to participants of the control group, i.e., second group of hypotheses. This appears for each country with no exceptions. Although not all the control groups had a sufficient number of participants to be compared with the pilot training group, the independent t-test revealed small (i.e.,  $p = .05$ ) to higher (i.e.,  $p = .001$ ) significant differences with improvements of critical thinking and self-nudging dimensions.

Students from Greece reported a significant difference for the improvement in critical thinking ( $t(67) = 3.48, p = .001$ ), in managing information ( $t(67) = 1.78, p = .04$ ), and in using alternative strategies ( $t(67) = 2.18, p = .016$ ). In The Netherlands students the differences of improvement were significant in critical thinking ( $t(40) = 1.14, p = .04$ ), in managing information ( $t(40) = 1.54, p = .05$ ), and in using alternative strategies ( $t(40) = 2.27, p = .014$ ). In Italian students, all the dimensions examined reported significant differences with the control group: critical thinking ( $t(98) = 2.91, p = .001$ ); managing information ( $t(95) = 2.28, p = .001$ ); simplifying information ( $t(94) = 1.95, p = .026$ ); reframing alternative ( $t(93) = 2.03, p = .002$ ); behaving critical explicitly ( $t(95) = 2.45, p = .001$ ); social influence ( $t(94) = 2.34, p = .011$ ); using alternative strategies ( $t(95) = 2.05, p = .002$ ); managing data ( $t(93) = 2.96, p = .003$ ); emotional affections ( $t(95) = 2.86, p = .002$ ). Significant differences among the groups of Portugal students were found in critical thinking ( $t(139) = 1.64, p = .03$ ), managing information ( $t(127) = 1.49, p = .006$ ), behaving critical explicitly ( $t(127) = 1.86, p = .04$ ), social influence ( $t(127) = 1.11, p = .004$ ) and emotional affections ( $t(127) = 1.53, p = .05$ ). In Spanish students, all the dimensions examined reported significant differences with the control group: critical thinking ( $t(24) = 2.56, p = .009$ ); managing information ( $t(24) = 3.08, p = .003$ ); simplifying information ( $t(24) = 3.14, p = .002$ ); reframing alternative ( $t(24) = 3.27, p = .002$ ); behaving critical explicitly ( $t(24) = 3.29, p = .002$ ); social influence ( $t(24) = 2.54, p = .009$ ); using alternative strategies ( $t(23) = 3.23, p = .002$ ); managing data ( $t(23) = 3.28, p = .002$ ); emotional affections ( $t(23) = 2.79, p = .005$ ).

## 3.2 Qualitative Part

Regarding the qualitative part of the assessment, four main aspects resulted from the analysis, namely: (a) Quality of the training program, (b) effectiveness of the training program, (c) contents of the training program, and (d) integration of the training program within VET curricula (see Table 3).

Table 3: Qualitative Results: Categories and Examples of Extracts From the Interviewees

Categories	Examples of Interview Extracts
(a) Quality of the training program	"Well, we [students] have been able to learn at our own pace, collaborate with teachers and trainers, it was good." (INT010/02)  "Thanks to the training, we [teachers] have also learnt more and maybe we have also shown higher level of critical thinking and media literacy to our students." (INT007/02)
(b) Effectiveness of the training program	"I wasn't expecting such a huge presence of cognitive biases. I think that ... at least, I am aware know. And it is more than nothing." (INT005/03)  "I had this meaningful experience when I noted that students were devising personal tips to solve problems. This was very satisfactory during the training program." (INT004/07)
(c) Contents of the training program	"... sometimes... I think that sometimes teachers had problems in enhancing critical thinking and media literacy. This is because they were engaged with too specific training practices. But in that case, we identified the problem and perhaps we were critical. Maybe, it was the task, I don't know." (INT001/08)  "The more we [teachers] have contents, the more we have opportunities to engage students in different activities for improving their critical thinking skills and media literacy. I think this is a good point." (INT012/10)
(d) Integration of the training program within IVET curricula	"Considering my experience, I think that we [students] should have more opportunities in the future. It is good to reflect on these aspects and also to practice." (INT001/10)  "Our ambition [teachers] is to add these competences in our curricula. Then, we would like to have a sort of a reference point to build our own activities... but you know, there are some institutional/regional barriers that we [teachers/trainers] cannot address." (INT013/09)

### 3.2.1 Quality of the Training Program

Participants' opinions on the kind of societal changes and labour transformation will lead to, stressed the crucial role of having a critical thinking mindset and, consequent behaviour, in daily life. Among the views of the interviewees there is a certain degree of consensus over the positive experience with the training program, linked with a positive perception of it. Some participants reported their moral and pragmatic concerns with regards to the information-driven society, highlighting and stressing the importance of being aware of one's own

irrational beliefs and cognitive biases, and the crucial importance of using reliable sources. Some participants (both students and trainers) emphasized the relevance of the opportunities offered using the Training program in the classroom, as the consequences of living in an information-driven society affect not only public environments, (e.g., school, work, etc.) but also the private sphere. In more detail, participants evaluated the training program as qualitatively good and relevant. However, there were some specific concerns coming from trainers on how to translate the teaching strategies in practical activities in their classes. Accordingly, some teachers reported how they had to adjust the training's exercises and practices according to their students' needs and level of school advancement. By means of example, since the training program's exercise were developed by a group of trainers from different country organisations, it was easier for teachers and trainers to use the strategies developed by their own organisation, rather than employing those from other countries. Despite this, the trainers used similar practices or re-adapted the already existing ones, which indicates that this issue has not compromised the quality of the pilot action.

### **3.2.2 Effectiveness of the Training Program**

Participants gave relatively high and positive judgments on the use of the training program. Moreover, they showed a shared view of training activities realised by the teachers and trainers and addressing the students. Particularly, students and teachers indicated how the skills developed were not limited to the classroom activities as they a) proposed a general definition of critical thinking and b) students reported how they applied some of the techniques in their daily life, out of their classrooms. First of all, teachers and trainers of all the organisations agreed on the importance and the linguistic meaning of having a critical thinking mindset and good levels of media literacy. They defined it as "the set of skills of an individual which allow them to deal with the information driven society without incurring in flawed and erroneous choices" leading to "avoiding getting lost". Such a result, although it partially echoes the definition of the academic literature, is particularly crucial for evaluating the effectiveness of the training, as trainers have been able to foster the students' capacity to offer a personal perspective on the content of the training. Secondly, this results in the long-term application of the techniques developed outside the classroom. Accordingly, students reported how they have applied this way of thinking and behaving in their daily life (e.g., when debating with peers or looking for information).

### **3.2.3 Contents of the Training Program**

Teachers reported that debating in the classroom and raising awareness of cognitive biases and prejudice is very interesting and stimulating. Indeed, the debating activity has been the

one most frequently used by teachers to sharpen students' critical thinking skills and media literacy. Some teachers and trainers, for example, created two groups with the task of confronting around a specific topic where two different positions can be sustained. During these activities, students made arguments concerning possible irrational beliefs, cognitive biases and the use of reliable sources. As such, the debates were more based on the students' ability of debunking arguments of others rather than on the use of good rhetorical way of presenting arguments. Despite these positive results, students as well as teachers and trainers reported some ways in understanding the notion of self-nudging, asking for a clearer description of the training technique and the related exercises.

### **3.2.4 Integration of the Training Program Within IVET Curricula**

One of the most interesting aspects reported by teachers, trainers and students was the fact that all agree on the importance of integrating the training program into IVET curricula, and more broadly into vocational education and training. They actually reported how useful it was for them to have the possibility to debate and think about the different ways through which they could make incorrect choices and assumptions due their own irrational beliefs, biases or when trusting unreliable sources. For most of them, it was quite surprising to understand how easy can be to make poor decisions. Accordingly, they suggested that IVET programs should entail at least 1-2 hours per week to develop and continue their critical thinking training. This is for improving students' skills and also to make them feel engaged and active, as well as fostering their sense of participation in civic life.

## **4 Discussion**

The study reported the results of the testing of a training program for the enhancement of critical thinking skills and media literacy in IVET students. Accordingly, the aim of the study was to shed light onto the effectiveness, gather knowledge on its usefulness and impact and identify implications for future initiatives. As noted before, the IVET context is a fragmented context which has no proper identification and specific guidelines at the international level concerning the provision of training on critical thinking and media literacy competences. The only main aspect characterizing IVET is that most of the time for education and training is devoted to the development of practical skills (European Union Communication, 2020). In the view of the information driven society with information creation, innovation, storage, and distribution being the modern currency of contemporary society (Bolaños & Salinas, 2021; Fraillon et al., 2014; Hague & Payton, 2011), owning skills and competences that support critical thinking skills and media literacy becomes crucial (Sartori et al., 2022; Tommasi et al., 2023). Coupling these moral and pragmatic issues, we found impetus for the realization

of a training program meant to foster critical thinking skills and media literacy in IVET students. Such an effort was realized thanks to the collaboration in the NERDVET project partnership comprising scholars and practitioners from six different countries.

#### **4.1 Narrative Discussion**

The training program was offered in an average duration of five months by trained trainers, while an assessment of its effectiveness has been carried out based on a mixed methods approach (Morse, 2016; Shorten & Smith, 2017). This mixed methods approach used for the evaluation of the training program involved both quantitative and qualitative methods. As previously mentioned, for the quantitative component of the assessment, IVET students who participated at the training program reported small to large significant differences for most of the investigated dimensions, with post-training dimensions having significant higher levels than those of the pre-training. Such improvements can be read as a consequence of the training program, as the comparison between control and experimental groups for the post-training dimensions revealed significant differences too. That is, provided that the experimental and control groups of each country have completed the same questionnaire and at the same time, the control groups showed significant lower levels in the dimensions considered when compared to the training group. This also indicates an improvement in the students of the training group, which appears as a positive effect of the training. In particular, the improvements observed indicate that students have reached higher levels for the dimensions considered, i.e., (a) debunking misinformation by using reliable sources, (b) raising awareness on biases, irrational beliefs and heuristics, (c) self-nudging (Sartori et al., 2022; Thaler & Sunstein, 2008; Torma et al., 2018).

Quantitative results echo in the qualitative part of the assessment, with indications about what worked well and why. Particularly, teachers, trainers and students who participated in the interviews showed a certain level of satisfaction with the activities of the training. Intriguingly, these results are in line with those of the pre and post comparison and the control vs experimental group analysis, according to which most of the students demonstrated higher levels of critical thinking and self-nudging dimensions of behaving critically and the management of complex information. Students expressed in different terms the quality and relevance of the training: For the most part, they reported how they were implementing training activities in their daily life after the training. This means that, indirectly, the students were not only focused on the activities at school, but also that teachers and trainers have been able to foster their capacity to behave critically even in private situations. Accordingly, this reminds to the background of the training, i.e., self-nudging notion. Students have shown to have improved their use of reliable sources while reducing irrational beliefs and cognitive biases, and, in particular, have shown proactive behaviours (Hertwig & Grüne-Yanoff, 2017;



Kenyon, 2014; Noorani et al., 2019; Soll et al., 2014). Lastly, teachers and trainers found the training activity itself interesting and relevant, also in the possibility that the Training program gives to support students in their critical thinking beyond the testing that was carried out within the NERDVET project.

As it has been argued throughout this paper, the participants' opinions gathered both by means of the standard training program monitoring, as well through the formal assessment system, are clear and uniform in reporting positive judgements on the training program experience. As a matter of fact, expressing it in different ways, all actors (teachers/trainers, students, supporting and project staff) directly involved in the training have stated that the training program should be systemically integrated in the curricula of their training centres and, furthermore, be taken up by any other interested vocational education and training or traditional education provider. More than that, offering such a training should not be left to the individual drive of teachers/trainers or VET providers, but the necessary political framework should be provided through a top-down process (European Commission, 2020; Riesmeyer et al., 2016; Tommasi et al., 2023; Perini et al., 2022).

Ultimately, our results offer a broader depiction of the quality of the training program while they also inform about the prospects of the implementation of such specific training programs in the context of IVET. Thanks to mixed methods approach comprising both quantitative and qualitative methods, our results provide empirical evidence which can serve future the interdisciplinary and international research in the context of IVET (Gessler et al., 2021).

## 5 Conclusion

To conclude, the use of both quantitative and qualitative methods helped to find evidence of the effectiveness of the training program while simultaneously evaluate the quality of the program. However, the study cannot give indications on the long-term effects of the training program as both the quantitative and qualitative parts were limited to the evaluation of the post-training effects and experience. Post-training quantitative assessment and qualitative data were prospective and recorded only once whereas the training was approaching to the end. Also, there might possible effects due to individual differences, as well as effects due to the duration of the program. However, we decided to not consider such aspects in our assessment since we opted for a specific focus on the broader value of the training program. Although it is possible that individual characteristics (e.g., gender) might affect the quality of training, these aspects do not limit our results but rather inform subsequent studies using the assessment approach as a baseline for the development of future exploration of the training program developed.

Nevertheless, this study makes two important implications for theory-building and research-conducting in the field of critical thinking skills and media literacy in the context of IVET. This study suggests that the use of a cognitive psychology framework applied in the context of education may offer interesting and useful tips for the realization of training program. Indeed, our training program finds its basis on a large and well-established research program in cognitive psychology, i.e., research on reasoning and rationality (Sartori et al., 2022; Ceschi & Fioretti, 2021). To take into account these calls for efforts in the education programs for the promotion of critical thinking can be supported by following lines of theoretical and applied research in psychology. In this context, seminal contributions have launched several training programs for helping individuals in reducing cognitive errors, and to not incur in irrational beliefs (e.g., Kahneman & Tversky, 1984; Tommasi et al., 2021).

## **Ethics Statement**

The study reported involves human participants and has been approved by the ethical committee of the University of Verona, Department of Human Sciences.

## **Acknowledgement**

The authors disclose receipt of the following financial support for the research, authorship, and/or publication of this article: Authors' work on this paper was supported by of the European Union funding for the project NERDVET, ERASMUS + KA3 – Support for Policy Reform, Social inclusion through education, training and youth. Moreover, the authors gladly acknowledge the community of NERDVET project partners who envision the study of critical thinking and media literacy in the context of IVET. They are representative of the following IVET centres in Europe: ENAIP NET (Italy), Centro San Viator (Spain), Stichting Vonk (The Netherlands), INOVINTER (Portugal), American Farm School – Perrotis College (Greece). Their staff members have contributed to the development of this paper. We are also grateful to the anonymous reviewers and the Editor, Professor Michael Gessler, and the Editor Officer, Dr. Susanne Peters, of the International Journal for Research in Vocational Education and Training (IJRVET), for their thoughtful editorial work and support.

## References

- Bolaños, F., & Salinas, Á. (2021). Secondary vocational education students' expressed experiences of and approaches to information interaction activities within digital environments: A Phenomenographic study. *Education and Information Technologies*, 26(2), 1955–1975. <https://doi.org/10.1007/s10639-020-10322-0>.
- Candido, V., Raemy, P., Amenduni, F., & Cattaneo, A. (2023). Could vocational education benefit from augmented reality and hypervideo technologies? An exploratory interview Study. *International Journal for Research in Vocational Education and Training*, 10(2), 138–167. <https://doi.org/10.13152/IJRVET.10.2.1>
- Caves, K. M. & Oswald-Egg, M. E. (2023). An empirical case of education policy Implementation in Serbian VET. *International Journal for Research in Vocational Education and Training*, 10(2), 191–219. <https://doi.org/10.13152/IJRVET.10.2.3>.
- Ceschi, A., & Fioretti, G. (2021). From bounded rationality to collective behavior. *Nonlinear Dynamics, Psychology, and Life Sciences*, 25(4), 385–394.
- Charmaz, K. (2008). Grounded theory as an emergent method. In S. N. Hesse-Biber & P. Leavy (Eds.), *Handbook of emergent methods* (pp. 155–172). The Guilford Press.
- European Union Communication. (2020). Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions. European skills agenda for sustainable competitiveness, social fairness and resilience. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0274&from=EN>
- Facione, N. C., & Giancarlo, C. A. (1998). Narratives of breast symptom discovery and cancer diagnosis: Psychologic risk for advanced cancer at diagnosis. *Cancer Nursing*, 21(6), 430–440. <https://doi.org/10.1097/00002820-199812000-00007>
- Fraillon, J., Ainley, J., Schulz, W., Friedman, T., & Gebhardt, E. (2014). Preparing for life in a digital age: *The IEA International Computer and Information Literacy Study international report*. Springer Nature. <https://doi.org/10.1007/978-3-319-14222-7>
- Gessler, M., Bohlinger, S., & Zlatkin-Troitschanskaia, O. (2021). International vocational education and training research: An introduction to the special issue. *International Journal for Research in Vocational Education and Training (IJRVET)*, 8(4), 1–15. <https://doi.org/10.13152/IJRVET.8.4.1>
- Glaser, B. G., Strauss, A. L., & Strutzel, E. (1968). The discovery of grounded theory; strategies for qualitative research. *Nursing research*, 17(4), 364.
- Hague, C., & Payton, S. (2011). Digital literacy across the curriculum. *Curriculum Leadership*, 9(10).
- Hertwig, R., & Grüne-Yanoff, T. (2017). Nudging and boosting: Steering or empowering good decisions. *Perspectives in Psychological Science*, 12(6), 973–986. <https://doi.org/10.1177/1745691617702496>
- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: A multidisciplinary journal*, 6(1), 1–55. <https://doi.org/10.1080/10705519909540118>.
- Kahneman, D., & Tversky, A. (1984). Choices, values, and frames. *American psychologist*, 39(4), 341–350. <https://doi.org/10.1037/0003-066X.39.4.341>.
- Kenyon, T. (2014). False polarization: Debiasing as applied social epistemology. *Synthese*, 191, 2529–2547. <https://doi.org/10.1007/s11229-014-0438-x>.
- Morse, J. M. (2016). *Mixed method design: Principles and procedures*. Routledge.

- Morse, J., & Neihaus, L. (2009). Mixed method design: Who needs it? In J. Morse (Ed.), *Mixed methods design: principles and procedures* (pp. 1–10). Routledge. <https://doi.org/10.4324/9781315424538>
- NERDVET. (n.d.). Think smart! Enhancing critical thinking skills and media literacy in VET. <https://nerdvet.eu/>
- Noorani, S., Baïdak, N., Krém o, A., & Riiheläinen, J. (2019). Integrating students from migrant backgrounds into schools in Europe: National policies and measures. Eurydice Brief. Education, Audio-visual and Culture Executive Agency, European Commission. EU Bookshop.
- Perini, M., Tommasi, F., & Sartori, R. (2022). Quali competenze e quali strategie formative per l'industria 4.0? Lo stato dell'arte. *Qwerty-Open and Interdisciplinary Journal of Technology, Culture and Education*, 17(1), 65–85. <https://doi.org/10.30557/QW000039>.
- Riesmeyer, C., Pfaff-Rüdiger, S., & Kümpel, A. (2016). Wenn Wissen zu Handeln wird: Medienkompetenz aus motivationaler Perspektive. *M&K Medien & Kommunikationswissenschaft*, 64(1), 36–55. <https://doi.org/10.5771/1615-634X-2016-1-36>.
- Sartori, R., Tommasi, F., Ceschi, A., Falser, M., Genero, S., & Belotto, S. (2022). Enhancing critical thinking skills & media literacy in initial vocational education and training via self-nudging: The contribution of NERDVET project. *Frontiers in Psychology*, 44–49. <https://doi.org/10.3389/fpsyg.2022.935673>.
- Shorten, A., & Smith, J. (2017). Mixed methods research: Expanding the evidence base. *Evidence-based nursing*, 20(3), 74–75. <https://doi.org/10.1136/eb-2017-102699>.
- Soll, J. B., Milkman, K. L., & Payne, J. W. (2014). A user's guide to debiasing. In K. Gideon & W. George (Eds.), *The Wiley Blackwell handbook of judgement and decision making, II* (pp. 924– 952). John Wiley and Sons, Ltd. <https://doi.org/10.1002/9781118468333.ch33>.
- Tacconi, G. (2011). *La didattica al lavoro: analisi delle pratiche educative nell'istruzione e formazione professionale* (Vol. 6). FrancoAngeli.
- Tacconi, G., & Morbioli, N. (2019). *Reinventare la scuola: la sfida dell'istruzione degli adulti in Italia*. Centro studi Erickson. University & Research.
- Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving decisions about health, wealth, and happiness*. Yale University Press.
- Tommasi, F., Ceschi, A., Sartori, R., Gostimir, M., Passaia, G., Genero, S., & Belotto, S. (2023). Enhancing critical thinking and media literacy in the context of IVET: A systematic scoping review. *European Journal of Training and Development*, 47(1/2), 85–104. <https://doi.org/10.1108/EJTD-06-2021-0074>.
- Tommasi, F., Perini, M., & Sartori, R. (2022). Multilevel comprehension for labor market inclusion: A qualitative study on experts' perspectives on Industry 4.0 competences. *Education+ Training*, 64(2), 177–189. <https://doi.org/10.1108/ET-04-2021-0146>.
- Tommasi, F., Ceschi, A., Weller, J., Costantini, A., Passaia, G., Gostimir, M., & Sartori, R. (2021). An empirical evaluation of tech interventions to improve financial decision-making. *European Journal of Training and Development*, 45(6/7), 633–649. <https://doi.org/10.1108/EJTD-11-2020-0169>.
- Torma, G., Aschemann-Witzel, J., & Thøøgersen, J. (2018). I nudge myself: Exploring 'self-nudging' strategies to drive sustainable consumption behaviour. *International Journal on Consumer Studies*, 42(1), 141–154. <https://doi.org/10.1111/ijcs.12404>.

## **Biographical Notes**

Francesco Tommasi is a Postdoctoral Researcher at the Department of Human Sciences of the University of Verona. He works in the field of work and organizational psychology and educational sciences with a particular emphasis on the study of competences, and labour market integration in the context of Vocational Education and Training.

Andrea Ceschi is Associate Professor in work and organizational psychology at the Department of Human Sciences of the University of Verona. He works on different topics in the field of work and organizational psychology and educational sciences with a particular emphasis on the study of decision-making process, cognitive biases and interventions for improving young and adult decision-making competence.

Sara Bollarino is a Project Officer in the International Area of ENAIP Veneto. She has a master's degree in Work, Organizational and Personnel Psychology, and collaborates as an intern researcher with the Department of Human Sciences, University of Verona.

Silvia Belotto is EU Project Manager and Executive Assistant for the International area of ENAIP Veneto and ENAIP NET. Since 2016, she has been working in the management of EU projects funded by the Erasmus+ (KA2, KA3), Interreg, LIFE, and CERV Programmes. As a Foreign Languages graduate, she carries out communication and external relations activities with partners and key-actors of the International VET field.

Silvia Genero is the head of ENAIP Veneto's International Area, EU Project Manager and Developer at ENAIP Veneto and ENAIP NET. Degree in Communication and Computer Science, Master of Arts in European Economics, Politics and Law at the College of Europe, she has been working on European funding programmes since 2012, first in the evaluation side of the process, then on the design and coordination side.

Riccardo Sartori is Associate Professor in work and organizational psychology at the Department of Human Sciences of the University of Verona. He works on different topics spanning from Human Resource Management to Innovation in Vocational Education and Training (VET) by employing a combination of psychological and educational theoretical frameworks. Teaching and studying in these fields, he has collaborated on different international projects in the field of VET.