



Multidimensional profiles of learning orientations and school achievement: a person-oriented approach in middle-school students

Giulia Vettori¹ · Claudio Vezzani¹ · Lucia Bigozzi¹ · Giuliana Pinto¹

Received: 14 July 2020 / Revised: 13 January 2021 / Accepted: 8 February 2021 /

Published online: 11 March 2021

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Abstract

A person-oriented approach was applied to the study of early adolescents' learning orientations to identify different profiles and their association with school achievement. A total of 244 middle-school students (male: 128; female: 116; $M\text{-age} \pm SD = 12.51 \pm .93$) completed a self-report questionnaire to explore cognitive, metacognitive, and affective dimensions of learning orientations. School achievements were collected in a range of school subjects. Cluster analyses and one-way MANOVA were carried out to verify the existence of profiles. Chi-square tests were used to test the association between profiles of learning orientations and school achievement. The results showed two profiles differently associated with school achievement: students “*Dragged by the current*” (Profile 1) showed low school achievement across school subjects, meanwhile students “*At the helm*” (Profile 2) reached excellent school achievement. In promoting middle-school students' achievement, it is important for teachers to consider students' profiles of learning orientations.

Keywords Learning-orientation profiles · School achievement · School subjects · Person-oriented approach · Middle school

Learning orientations: cognitive, metacognitive, and affective dimensions

A significant part of the Italian middle-school population is composed of underachieving students, showing low school achievement in a range of school subject areas and scarce school adjustment (e.g., INVALSI report 2019; Organization for Economic Co-operation and

✉ Giulia Vettori
giulia.vettori@unifi.it

¹ Department of Education, Languages, Intercultures, Literatures and Psychology, University of Florence, 12 Via di San Salvi, Building 26 (Psychology Section), 50135 Florence, Italy

Development [OECD] 2016). Students' underachievement has a twofold consequence. On the one hand, it compromises students' short-and-long term educational, work aspirations (e.g., university programs, specialization courses) and it negatively impacts on academic self-concept and self-esteem (e.g., Coelho et al. 2017); on the other hand, it also negatively affects the quality level of the scholastic institution.

In the literature, low school achievement and academic failure have been predicted by different constructs (e.g., Akos et al. 2015). Achievement motivation (Story et al. 2009), fear of failure (Caraway et al. 2003), attribution theory (Graham 2016), learned helplessness (Sorrenti et al. 2018), goal theory (Wolters 2004), and approach-avoidance motivation (Elliot and Pekrun 2007) are all related to school achievement. In addition, learning orientation theory has become a widely used construct to understand students' learning behavior and achievements at school. The dimensions of cognitive processing strategies, metacognitive regulation strategies, conceptions of learning, learning motivations, and emotions concur to the construct of learning orientation (Vermunt and Donche 2017). Cognitive processing strategies indicate various cognitive learning activities that students adopt to elaborate learning contents with the aim of gaining new information, understanding, and increasing competence (e.g., Linnenbrink and Pintrich 2004). Metacognitive regulation strategies (see Efklides 2006 for a review) refer to students' processes of regulation of cognition (Hadwin et al. 2011; Seufert 2018; Sperling et al. 2012), such as planning, monitoring, and evaluation of their cognitive learning processes (e.g., Huff and Nietfeld 2009; Leutwyler 2009). Conceptions of learning refer to the metacognitive internal representations that students possess about learning (e.g., Van Rossum and Hamer 2010; Vermunt and Donche 2017). Previous studies have shown that conceptions of learning have a multifaced nature (e.g., Cantoia et al. 2011; Pérez-Tello et al. 2005), since they may refer to cognitive processes (e.g., "Learning is mostly a matter of concentration and commitment" from Authors 2018c), to metacognitive regulation processes (e.g., "Only by testing one's knowledge does a person come to authentic learning" from Authors 2018c), and affective-motivational experiences ("I see learning as something that makes me anxious" from Authors 2018c), such as anxiety, pleasure, and satisfaction (e.g., Pekrun and Linnenbrink-Garcia 2012). Furthermore, previous studies have shown that conceptions of learning may also encompass individuals' beliefs about the nature of knowledge. This aspect recalls the construct of epistemic beliefs (Muis 2007), in that it includes beliefs that knowledge derived from an authority figure such as the teacher (e.g., "To really learn I need someone to teach me" from Authors 2018c). Finally, conceptions of learning may encompass individuals' beliefs about the nature of knowing (e.g., McNerney 2008) calling into play the individual (e.g., "I learn when I work alone" from Authors 2018c) or social (e.g., "A person really learns through discussion and debating with others" from Authors 2018c) nature of knowing and learning. Prior studies (e.g., Li et al. 2018; Purdie et al. 1996) showed close relations between students' conceptions of learning and self-regulation. Such findings suggest using self-report questionnaires that allow the collection of students' points of view about learning (Tsai et al. 2011).

Besides conceptions of learning, a further dimension of learning orientation is composed of learning motivations and emotions. This motivational-affective area (Prat-Sala and Redford 2010) of learning orientations includes students' motivation goal orientations (mastery goal, extrinsic orientation, and ability orientation) (Pintrich 1999; Ryan and Deci 2000) and academic reactions, such as anxiety, pride, boredom in line with Pekrun's control-value theory of achievement emotions (e.g., Goetz et al. 2016). Prior studies have shown that emotions are closely related to self-regulation (Pekrun et al. 2002; Pekrun 2011).

Learning orientations and school achievement

Learning orientations capture the pattern of relations between students' cognitive, metacognitive, and affective dimensions of learning. Studies conducted in the context of higher education have demonstrated the existence of different patterns of relation between these components. For example, Vermunt (1998), through factor analyses, identified four student patterns denoting different *orientations* (Ramsden 1988) toward learning: *reproduction-directed learning*, *meaning-directed learning*, *application-directed learning*, and *undirected learning*. The *reproduction-directed learning* pattern is composed of reproductive cognitive processes and rehearsal strategies, the need for external regulation, a view of learning as a mainly receptive and passive process from an external source to students, and an extrinsic motivation. The *meaning-directed learning* pattern is composed of deep processing strategies (e.g., critical processing), self-regulation (e.g., planning, monitoring, evaluating), a view of learning as construction of knowledge responsibility for which resides in students, and motivation by personal interest. The *application-directed learning* pattern is composed of concrete processing, both self-regulated and externally regulated ways, a view of learning as use of knowledge, and as a vocational motivation. The *undirected learning* pattern is composed of a scarce awareness about how to approach studying activities, a lack of regulation, a view of learning as stimulating education and cooperative learning, and an uncertain motivation toward studying.

The identification of different learning orientations among university students led researchers to further examine the existence of the impacts of the different learning orientations on academic outcomes. In this respect, Vermunt and Vermetten (2004) highlighted that students' learning orientations are associated with their approaches to studying. Vermunt (1998, 2005), through regression analyses, identified the predictive role of learning orientations on learning outcomes. The *reproduction-directed learning* and *undirected learning* patterns showed negative associations with exam performance. The *meaning-directed learning* pattern positively impacted on exam performance transversally to different academic disciplines, whereas the *application-directed learning* pattern did not impact on exam performance in conventional university education, but it had a significant positive relation with exam performance in the specific discipline of Pharmacy (Smith et al. 2007).

Psychology and educational researchers have shown that students' learning orientations stand out for their significant role in predicting learning outcomes in the context of higher education. Few studies have focused on middle-school students. Those studies examining middle-school students focused on testing the predictive value of constructs separately, rather than considering their interactions. For example, Pinto (2018) identified that middle-school students' conceptions of learning predict school achievements. For example, conceptions linked to the assumption of an active role in learning and those linked to personal growth positively predicted scholastic achievement. Meanwhile, middle-school students' conceptions of learning linked to a passive and receptive role negatively predicted school achievement. Furthermore, a relation between learning strategies, conceptions of learning, and school achievement was found in middle-school students (Vettori et al. 2018). However, as suggested by the literature (e.g., Muis 2007; Pintrich 2002), it is important to extend this field of studies by considering the interplay between cognitive, metacognitive, and affective dimensions in strict relation when trying to detect potential antecedents of school performances. Thus, further investigations are necessary to investigate middle-school students' learning orientations.

The need for a person-oriented analysis of middle-school students' learning orientations

The person-oriented approach allowed us to identify groups of individuals sharing specific configurations of learning dimensions related to each other, rather than focusing on the identification of a single variable among a general population of students (e.g., Fryer et al. 2016; Lindblom-Ylänne et al. 2013). In the literature, a person-oriented approach has been applied to the study of different learning constructs. For example, Vettori et al (2020a, 2020b) have shown three distinct profiles denoting qualitatively different conceptions of learning. Furthermore, a person-oriented approach has been used to identify upper-elementary students' more or less advantageous achievement emotions with respect to mathematics learning and performance (see, Hanin and Van Nieuwenhoven 2019). Other studies have focused on middle-school students. Hayenga and Corpus (2010) identified intrinsic and extrinsic motivational profiles and their association with academic achievement. Those research steps need to be followed by the analysis of middle-school students' profiles of learning orientation that encompass cognitive, metacognitive, and affective dimensions of learning. Through the application of a person-oriented approach (Bergman and Magnusson 1991) to the studying of learning orientations, it will be possible to identify different groups of students based on the different patterns of relations between cognitive, metacognitive, and affective dimensions of learning (e.g., Roeser et al. 2002). The identification of profiles will allow us to examine whether and how different profiles of middle-school students' learning orientations might enhance or inhibit successful school achievement. Each dimension of learning orientations is able to provide insights about learners as more or less able to self-regulate "their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features in the environment" (Pintrich 2000, p. 453). This research step is particularly important when considering middle-school students, given that they are facing a challenging transition in the educational path of a student (e.g., Winberg et al. 2019). Middle school is a pivotal moment in the education system of many countries characterized by several adaptations especially in the first year for the reason that students find a different school context (curriculum, structures, and functioning) from the primary school, as well as in the third year for the reason that students are finishing with a final middle-school exam and preparing themselves to enter upper-secondary school. In this work, we assume the meaning of a broad transition when considering the entire middle-school cycle, given that several characteristics unite the three years in terms of redefinition of the academic self, development of an autonomous and self-regulated approach to the studying activity (e.g., Weis et al. 2013). Profiles of learning orientations provide useful information for the teacher to modulate instructional actions, acting in a way that supports strengths and encourages the elimination of weaknesses.

Rationale

Prior research has demonstrated that learning orientations (cognitive, metacognitive, and affective dimensions of learning) associate with academic achievements. However, most of the reviewed studies have targeted university populations, leaving aside middle-school students. Middle school is considered a challenging educational phase. This is reflected in the great number of underachieving students in Italy, as in other European countries, which undermine educational and work prospects. Hence, to contribute with further results that can be compared with previous findings, this study focuses on identifying middle-school students'

learning orientations. In pursuing this research step, we found it useful to assume a person-oriented approach that allows us to identify different groups of middle-school students sharing specific combinations of cognitive, metacognitive, and affective dimensions of learning. In a realistic and authentic way of understanding the learning process, these denote different learning orientations (see, Garcia and Pintrich 1994). Considering that learning orientations contribute to learning outcomes, we also examined the associations between middle-school students' profiles of learning orientations and school achievement. We found it opportune to examine this relation by collecting the scores obtained at the end of the school year in a range of different subjects based on teachers' school reports. Those final scores were the result of a series of tests, both oral and written, carried out during the school year and they are a necessary condition for promotion at school. In the Italian educational system, the passage to the following school year depends on those final scores (Ministry of University and Research, MIUR). The consideration of this comprehensive measure of school achievement will allow examination of the impact of profiles of learning orientations on school achievement in a more reliable way, rather than examining the impact of profiles on a single-exam performance or on measures derived from students' self-evaluation.

The results of this study should be particularly informative to compare results coming from different school years or educational contexts, given that different patterns of learning orientations are dynamically involved in different educational phases and cultural contexts (Vermunt and Donche 2017). Furthermore, the acquisition of information about middle-school students' profiles of learning orientation that associate with low or high school achievements will be particularly useful for teachers, school psychologists, and educational practitioners for the implementation of effective interventions able to sustain students' motivation, self-regulation, and other learning resources.

Aims and hypotheses

The aims of the present study were the following:

1. to identify the profiles of aggregation between cognitive, metacognitive, and affective dimensions of learning orientations measured by LO-COMPASS in middle-school students;
2. to test the association between the profiles of aggregation between cognitive, metacognitive, and affective dimensions of learning orientations measured by LO-COMPASS and school achievement in middle-school students.

With regard to the first aim, based on previous findings that showed different university students' learning orientations (Vermunt 1998, 2005), we predicted the existence of different middle-school students' profiles of learning orientation. Specifically, on the one hand, students may show a profile of learning orientation including deep cognitive processing, self-regulation strategies, a view of learning as construction of knowledge, and a personal learning orientation accompanied by feelings of confidence and pleasant affective reactions. On the other hand, students may show a profile of learning orientation including reproductive and rehearsal cognitive processing, scarce self-regulation strategies, a view of learning as gaining information role, and scarce personal involvement in learning.

With regard to the second aim, we expected that different middle-school students' learning orientations might lead to either low or excellent school achievement. Specifically, we

expected that students with a profile of learning orientation including deep cognitive processing, self-regulation strategies, a view of learning as construction of knowledge, and a personal learning orientation would reach higher school achievement with respect to those students with a profile of learning orientation including reproductive and rehearsal cognitive processing, scarce self-regulation strategies, a view of learning as gaining information role, and scarce personal involvement in learning. This expectation is in line with results in the literature (Vermunt 1998, 2005). We also ascertained whether this relation is different with respect to school subjects or whether it underlies school achievement in general.

Method

Participants

A total of 244 students in an age range from 11 to 13 attending the first, second, and third years of lower-secondary education (Forms 1–3) that correspond to Level 2 - ISCED 2011 (Equivalent to grades 6, 7, 8 for the USA context) gave their consent to participate in this research. Specifically, they were 128 males ($M\text{-age}\pm SD = 12.43 \pm 1.12$) and 116 females ($M\text{-age}\pm SD = 12.57 \pm 0.91$). Their parents and school authorities also provided their consent. This is a convenience sample (McBurney and White 2009) recruited from two middle (lower-secondary) schools located in the central part of Italy. Their family socio-economic and educational background varied from middle to lower-middle class level. Students with certified learning disabilities and foreign students living in Italy for less than 5 years were excluded from the sample. The distribution of participants by gender and class is shown in the following Table 1.

The percentage distributions in the table show how the sample was balanced both by gender and year of school, also considering these two variables simultaneously (i.e., in interaction with each other). We can therefore exclude the presence of a measurement bias attributable to the lack of control of these two social variables.

Characteristics of the educational system

In Italy, primary school is the first level of formal education, it lasts 5 years and starts in the middle of September for children who have turned 6 or will turn 6 in that calendar year and ends in June of the fifth year when the children are about 11 years old. Primary school envisages the presence of a maximum of three teachers and one of them plays the

Table 1 Crosstab of the conjoint distribution of gender and school year attended

School year				
Gender	1 st	2 nd	3 rd	Total
Male	47 (36.7%)	40 (31.3%)	41 (32.0%)	128 (100%)
Female	36 (31.0%)	34 (29.3%)	46 (39.7%)	116 (100%)
Total	83 (67.7%)	74 (60.6%)	87 (71.7%)	244 (100%)

Note. The percentages reported in brackets represent the raw percentages; they refer to the total number of males and to the total number of females.

role of “prevailing teacher”, becoming a reference point that is also affective. Having attended the primary school (grades 1 to 5), students pass to secondary education which is divided into two consecutive steps: the first is the middle school, also known as lower-secondary school, and after the second is the upper-secondary school. Attending the three middle-school years is a very challenging experience for students who are at a critical age and are facing many changes in their studies and in the school context. Middle school begins in September for children who have turned 11 or will turn 11 in that calendar year and ends when the children are about 14 years old. In the transition to middle school, the class group of the primary school breaks up and new ones are formed by some students who already know each other and others who are unknown. In the middle school, there are about 9 teachers instead of 2 or 3 primary school teachers, each one teaches a different subject, each lesson of a subject lasts one or maximum of 2 h and in a day the teachers alternate for about 5 or 6 consecutive hours with a short interval of 10 min. The relationship with the teachers becomes much more formal than in the previous primary-school years. Middle-school students could be encouraged to learn how to manage this different, complex network of relationships and complex patterns of learning goals and organization. Middle-school students are greatly involved in homework management on their own (Xu and Corno 2003) and often have to give up sports or other recreational activities they have done previously until they acquire an efficient and autonomous method of study.

Procedure

To measure the students’ learning orientations, the administration of a self-report instrument was undertaken at the beginning of the school year during scholastic time and it was filled out in a collective way with the presence of both teachers and researchers. The students responded to all the proposed items in about 25 min. During the administration, the researchers and teachers were available to answer all specific questions related to particular items of the questionnaire and regarding response format. In a second step at the end of the school year, students’ academic achievement at Language and Literature, Foreign Language, and Mathematics was collected through the final report of evaluation by teachers.

Measures

Students’ learning orientations

The recently devised self-report instrument “LO-COMPASS: Learning Orientation-Cognition Metacognition Participation Assessment” Vettori et al. (2020b) was used to measure middle-school students’ learning orientations covering cognitive, metacognitive, and affective dimensions of learning. The questionnaire is based on a “top-down approach” which groups the theoretically based selection of the constructs associated with scholastic achievement and includes only those factors that showed significant direct and indirect effects on school achievement (Pinto et al. 2018; Vettori et al. 2018). LO-COMPASS consists of 20 items to be answered on a 5-point Likert response scale (1= strongly disagreeing; 5= strongly agreeing). LO-COMPASS shows a 4-factor structure: (1) “*Learning as a self-regulated and strategic experience*” (7 items); (2) “*Learning as a process of affective, motivational and co-constructive activation of Self*”

(5 items); (3) “*Learning as guided practice*” (4 items); (4) “*Learning as participation in school practices*” (4 items).

The first factor “*Learning as a self-regulated and strategic experience*” refers to the usage of cognitive strategies (example item “As the teacher speaks, I make notes to remember and understand better”), as well as to metacognitive regulation when students monitor the usage of cognitive strategies (example item “I have a habit of checking if I really understood what I studied, asking questions or doing exercises”). High scores in the first factor describe a student highly engaged in cognitive processing of content matter through the use of learning strategies, such as taking notes, writing down the most important parts of a text, as well as regulative processing, through the use of self-regulation strategies, such as planning, monitoring, and checking the learning process with respect to learning goals.

The second factor “*Learning as a process of affective, motivational and co-constructive activation of Self*” refers to the motivational-affective component of learning. It implies affective reactions, motivation, and relations with others. Learning is conceived as an opportunity for personal growth and great value is attributed to fellow students and teachers. Stimulating education through co-construction of meaning and cooperation are key elements.

The third factor “*Learning as guided practice*” implies a vision of learning as a process of co-construction of knowledge mainly driven by the expert in which the students’ cognitive activities are displayed through listening, concentration, and cognitive effort.

The fourth factor “*Learning as participation in school practices*” refers to students’ “pragmatic awareness” of the opportunities that the school and class contexts provide for learning and helping to overcome difficulties. For example, dialoguing fosters the

Table 2 Conceptual content areas, internal reliability and example items for each factor of LO-COMPASS

Factor	Conceptual content areas	Internal reliability (McDonald’s Omega)	Example item
Learning as a self-regulated and strategic experience	Self-regulation, strategic learning	.76	As the teacher speaks, I make notes to remember and understand better
Learning as a process of affective, motivational and co-constructive activation of Self	Emotion, motivation, co-construction	.71	I feel learning as something based on self-confidence
Learning as guided practice	Transmission of knowledge Passive receptive role by the student	.64	You really learn when you listen to explanations given by an expert
Learning as participation in school practices	Pragmatic awareness about learning in the school context	.64	I prepare myself in a different way for oral questioning, for a class assignment or for group work

understanding and elaboration of contents and answering may help to clarify concepts or learning situations and events.

The results of the structural validity of the LO-COMPASS self-report instrument showed adequate psychometric properties. The CFA results showed satisfactory goodness of fit indices (CFI = .89; RMSEA = .04; SRMR = .06) (Table 2).

School achievement

School achievements were collected in a range of subject areas at the end of the school year in the month of June from the final evaluation report by teachers. In this study, we considered school achievement obtained in the three school subject areas of Language and Literature, Foreign Language, and Mathematics, given their academic and curriculum relevance (e.g., number of lesson hours). School achievements received in each school subject constituted a comprehensive evaluation resulting from a series of single examinations performed during the school year (e.g., oral examinations and written tests) and evaluated by different teachers, depending on the school subjects. School achievements were attributed on a score ranging from 0 to 10, the sufficient level fixed at 6. They are expressed on a categorical scale because there is not the same distance between the scores; the difference between 3 and 4 is not equivalent to that between 6 and 7. At the end of the school year, the student must have an average of 6 in each subject to successfully pass to the subsequent school year.

Data analyses

In order to check the normality of the distribution of each dimension detected by the instrument, the descriptive statistics (mean, standard deviation, asymmetry coefficients, and kurtosis) were calculated; specifically, the factorial scores were calculated by computing the sum of the answers provided by the participants to the items belonging to the same factorial construct. Items with asymmetry and kurtosis coefficients not included between $-1/+1$ (Marcoulides and Hershberger 1997) were significantly different from a Gaussian curve.

Consistent with the first aim of identifying specific profiles of aggregation of the 4 constructs measured by the questionnaire, a cluster analysis procedure organized in two sequential steps was implemented on the factorial dimensions measured by LO-COMPASS. Before carrying out the cluster analysis, each factor score was standardized in Z points. In a first step, a cluster analysis using Ward's algorithm was run, which is an agglomerative and hierarchical approach, useful to explore the possible aggregations of data. In a second step, a K-means estimation algorithm was used to identify the final clusters, using the seed points that arose from Ward's hierarchical cluster analysis. This procedure in the two steps of the cluster analysis is most important; indeed, the parallel threshold method used by default in the K-means can produce a different cluster solution depending on which initial random seed point is selected. Differently, with Ward's algorithm (as in this case) it is possible to set the initial seed point used in the K-means cluster analysis, which will therefore not be estimated randomly. Furthermore, to demonstrate the presence of a significant difference between the two profiles, a one-way MANOVA was performed. Moreover, to demonstrate that the frequency distributions of the two profiles were balanced in the two genders and in the three scholastic classes, two Chi-square tests were performed.

Consistent with the second aim of exploring the association between membership profile and scholastic achievement, encoded by three different school grades (6–7 vs. 8 vs. 9–10),

three Chi-square tests were performed. The analysis was implemented using the IBM SPSS statistical package (v. 23.0).

Results

The descriptive statistics related to factorial scores measured by LO-COMPASS are reported below (Table 3).

The coefficients of asymmetry and kurtosis reported in Table 3 ranged between -1 and $+1$ for all 4 factors. So, the probability distributions of all factors of LO-COMPASS were considered as close to a Gaussian curve.

Identify profiles of membership and their distribution in the classes: cluster analysis, MANOVA and Chi-square

The results of the cluster analysis in two steps (Ward's method + K-means) allowed us to identify two preferential aggregation patterns among the factorial scores of the instrument, thus allowing us to identify two significantly diversified "profiles" (Graph 1).

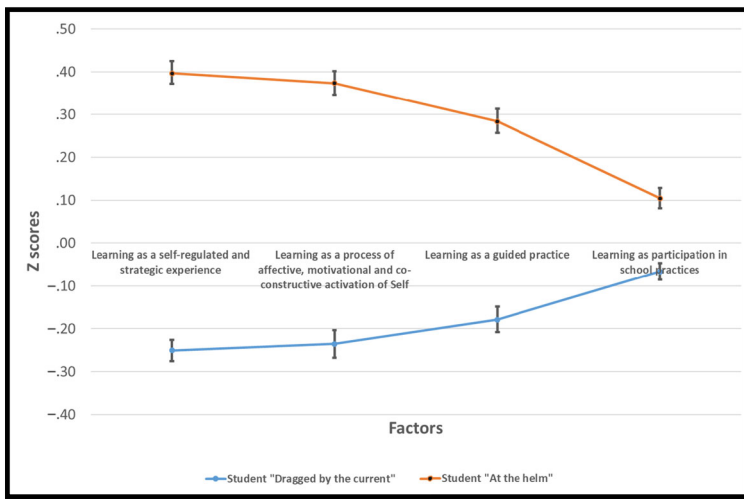
The students "*Dragged by the current*" (Profile 1) showed lower mean values in all the latent factors measured by LO-COMPASS than the mean values that characterized the students "*At the helm*" (Profile 2), who consider learning from a very different learning orientation to each other.

The gender distribution in the two profiles resulted balanced and statistically not significant ($\chi^2(1) = 3.85, p = \text{n.s.}$). The students "*Dragged by the current*" (Profile 1) were characterized by 55.9% of males and 44.1% of females, whereas students "*At the helm*" (Profile 2) were characterized by 41.2% of males and 58.8% of females. The frequency of the two profiles in the three middle school years resulted equidistributed ($\chi^2(2) = 0.15, p = \text{n.s.}$) (Table 4).

In order to demonstrate the presence of a significant difference between the two profiles in each latent factor, a one-way MANOVA was performed, in order to identify in which factorial dimensions, the two profiles (obtained from the cluster analysis) were significantly different. The results obtained showed a significant Hotelling Trace [$F(4, 237) = 4.78, p < .01$]. Furthermore, each ANOVA showed significant difference between the two groups for all the dimensions measured by the questionnaire ("*Learning as a self-regulated and strategic experience*": $F(1, 242) = 279.94, p < .001$; "*Learning as a process of affective, motivational and co-constructive activation of Self*": $F(1, 242) = 176.13, p < .001$; "*Learning as guided practice*": $F(1, 242) = 107.26, p < .001$; "*Learning as participation in school practices*": $F(1, 242) = 30.71, p < .001$) and showed that the students "*Dragged by the current*" (Profile 1)

Table 3 Descriptive statistics of the factorial scores: mean, standard deviation, skewness, and kurtosis coefficients

Factor	M	DS	Skewness	Kurtosis
Learning as a self-regulated and strategic experience	13.70	2.65	.18	-.83
Learning as a process of affective, motivational and co-constructive activation of self	18.07	3.72	-.63	.53
Learning as guided practice	15.17	2.82	-.64	.28
Learning as participation in school practices	14.71	2.71	-.38	-.56



Graph 1 Mean distributions of the factorial scores of LO-COMPASS in the two achievement profiles individuated by cluster analysis. *Note.* Students “*Dragged by the current*” (Profile 1) showed lower mean values in all the latent factors measured by LO-COMPASS than the mean values that characterized students “*At the helm*” (Profile 2). The vertical whiskers represent the standard errors of means

had a higher mean score in all the factors. The statistical analyses pointed out, indeed, students “*Dragged by the current*” (Profile 1; $n = 150$) were characterized by an average centroid for the factors “*Learning as a self-regulated and strategic experience*” ($Z_M = -.25$), “*Learning as a process of affective, motivational, and co-constructive activation of Self*” ($Z_M = -.24$), “*Learning as guided practice*” ($Z_M = -.18$) and “*Learning as participation in school practices*” ($Z_M = -.07$), significantly lower than students “*At the helm*” (Profile 2; $n = 94$) in all four factors (“*Learning as a self-regulated and strategic experience*”: $Z_M = .40$; “*Learning as a process of affective, motivational, and co-constructive activation of Self*”: $Z_M = .37$; “*Learning as a guided practice*”: $Z_M = .28$; “*Learning as participation in school practices*”: $Z_M = .10$).

Association between profiles and achievement: Chi-square test

To explore the association between membership of a specific profile and school achievement, three Chi-square tests were carried out on three crosstabs between each school subject (Language and Literature, Mathematics, and Foreign Language) and membership of the two-achievement profiles (Tables 5, 6, and 7).

Table 4 Crosstab of the conjoint distribution of profiles and school year attended

School year		1 st	2 nd	3 rd
Profiles				
Students “ <i>Dragged by the current</i> ” (Profile 1)		46 (0.2)	41 (0.2)	46 (-0.4)
Students “ <i>At the helm</i> ” (Profile 2)		37 (-0.2)	33 (-0.2)	41 (0.4)

The data outside brackets in the table represent the absolute frequency of each cell, and in brackets the adjusted residual is reported.

Table 5 Conjoint frequencies of the Language and Literature score of students with the respective achievement profile

Language and Literature score			
Profiles	6-7	8	9-10
Students “ <i>Dragged by the current</i> ” (Profile 1)	48 (2.5)	29 (0.3)	10 (-3.5)
Students “ <i>At the helm</i> ” (Profile 2)	16 (-2.5)	15 (-0.3)	18 (3.5)

Note. The Language and Literature scores were out of 10. The data outside brackets in the table represent the absolute frequency of each cell, and in brackets the adjusted residual is reported.

The results showed that the membership profile was significantly associated with all the scores in the three school subjects (Language and Literature score: $\chi^2(2) = 13.15, p < .01$; Mathematics score: $\chi^2(2) = 11.39, p < .01$; Foreign Language score: $\chi^2(2) = 10.79, p < .01$). In particular, the adjusted standardized residuals indicated a coherent trend of association: students “*At the helm*” (Profile 2) had a higher score in Language and Literature (Adj. std. res. = 3.5), Mathematics (Adj. std. res. = 3.2) and Foreign Language subject (Adj. std. res. = 2.9) with respect to students “*Dragged by the current*” (Profile 1); whereas students “*Dragged by the current*” (Profile 1) showed a significant lower score in Language and Literature (Adj. std. res. = 2.5), Mathematics (Adj. std. res. = 2.6) and in Foreign Language subject (Adj. std. res. = 2.7) with respect to students “*At the helm*” (Profile 2) (Tables 5, 6 and 7).

Discussion

The results of cluster analysis allowed us to identify the existence of two meaningful profiles of learning orientations among middle-school students. In this study, we have adhered to a vision of learning as a complex multi-component experience that relies on the interplay between cognitive, metacognitive, and affective dimensions. Middle-school students’ profiles of learning orientations with a significant and reliable power to associate with low and excellent school achievement were identified. The set of results has allowed us to adopt the metaphor that compares learning to navigation that has led us to label students’ profiles: “*Dragged by the current*” students (Profile 1) and “*At the helm*” students (Profile 2). The results provide empirical support to the validity for considering the simultaneous presence of different cognitive, metacognitive, and affective dimensions of learning organized in profiles to describe both high and low achievers. Thus, our results support a multidimensional model of

Table 6 Conjoint frequencies of the Mathematics score of students with the respective achievement profile

Mathematics score			
Profiles	6-7	8	9-10
Students “ <i>Dragged by the current</i> ” (Profile 1)	59 (2.6)	21 (-0.3)	7 (-3.2)
Students “ <i>At the helm</i> ” (Profile 2)	22 (-2.6)	13 (0.3)	14 (3.2)

Note. The Mathematics scores were out of 10. The data outside brackets in the table represent the absolute frequency of each cell, and in brackets the adjusted residual is reported.

Table 7 Conjoint frequencies of Foreign Language score of students with the respective achievement profile

Foreign Language score			
Profiles	6–7	8	9–10
Students “ <i>Dragged by the current</i> ” (Profile 1)	46 (2.7)	28 (−0.3)	13 (−2.9)
Students “ <i>At the helm</i> ” (Profile 2)	14 (−2.7)	17 (0.3)	18 (2.9)

Note. The Foreign Language scores were out of 10. The data outside brackets in the table represent the absolute frequency of each cell, and in brackets the adjusted residual is reported.

learning orientation in middle-school students, as already confirmed in university students (Vermunt and Donche 2017).

This study contributes to overcoming the artificial consideration of the predictive role of different learning dimensions on school achievements, in a separate way.

Our results allow us to shed light on the specific characteristic of middle-school students “*Dragged by the current*” (Profile 1) showing low school achievement. This non-adaptive profile draws a student showing several gaps at once. These students are concentrated on understanding the learning context surrounding them, its structure, rules, and functioning. Students “*Dragged by the current*” (Profile 1) are characterized by a poor strategic attitude to studying, a weak understanding of what the best methods to learn are, and scarce strategic use of learning strategies across different school subjects. Students “*Dragged by the current*” showed low scores on items, such as “During study I find it hard to tell if I’m prepared or not”. This profile describes a student who is neither one who studies well on his/her own, nor one who builds learning with others. They fail to link the learning subjects with their personal values and interests. Furthermore, students “*Dragged by the current*” showed low scores on items such as “I see learning as something based on self-confidence”) and superficially tend to comprehend the helping role of the class group activities and relations, indeed they showed low scores on the item “I feel that I really learn through discussion and confrontation with others”). Their low participation in the school context functioning may also help explain their difficulties in gaining benefits from the school opportunities that are available (Chazan et al. 1998), which in turn generates a perception of disorientation of the learning context they move in. These students recognize teachers in their specific role as guide, however they view learning as far away from their active and autonomous role as learners (low scores on the item “As the teacher speaks, I make notes to remember and understand better”), so if they turn to other people, they do it to ask for help in a dependent way (high scores at the item “In order to really learn I need someone to teach me”). As suggested in the literature (e.g., Murberg 2010) the assumption of a passive role in school activities can be explained as an inhibited relational modality to preserve a feeling of security and self-esteem by avoiding social interactions or bringing oneself into play, not questioning authority (conformist way) when the student feels uncertainty of success. A profile like this is dysfunctional precisely because it is deficient in all these aspects at the same time, which is why such a student cannot rely on any support to achieve good results. Students “*Dragged by the current*” (Profile 1) lead us to think that students have not dealt with the new requests of the school environment linked to developing a sense of autonomy and self-regulation. Concerning school achievement, our results have

shown that students “*Dragged by the current*” (Profile 1) recorded low school achievement across school subjects, despite the potential corrective effect of school subject interest or specificity that might have come into play (e.g., Zhang 2008). The fact that students “*Dragged by the current*” (Profile 1) associated with low performance in the school subjects considered in this study (i.e., language and literature, foreign language, and mathematics) shows that these associations are independent of the variables related both to the specific content of the subjects and to the variable constituted by the characteristics of the teacher who teaches them (e.g., Zhang 2008). Each school subject is taught by a different teacher, each of which has her/his own teaching method and his/her own subjective criterion in the student’s evaluation, which can be more or less severe. The combination of low scores at the cognitive, metacognitive, and affective dimensions of learning traced in the first profile led us to think that they have in common a disorientation which might be linked to the fact that they are in transition (e.g., Akos et al. 2015). In the middle-school years, students experience a significant change in terms of school context and a strong commitment is required to take long-term education, profession, and life decisions, also affecting their identity development (see, Erikson 1968). The middle-school transition involves a range of developmental goals while remodeling their self-image, personal, social, school- and learning-related identity aspects (see, Verhoeven et al. 2019). Thus, students’ internal balances in terms of self-representation and representation about the learning process may have been brought back into play, causing a sense of disorientation.

Students “*At the helm*” (Profile 2) have shown a learning orientation characterized by internal motivation, opportunity for personal growth, and changing as a person. In this profile, great value is recognized for the co-construction process in learning. These students recognize the role and the value of fellow students and teachers. As suggested in the literature (Murberg 2010), a student’s perception of support in school links with a sense of school community and a feeling of security, as well as with school adjustment and wellbeing. Students “*At the helm*” (Profile 2) are actively involved in the learning process and highly engaged in cognitive processing of content matter (e.g., taking notes, writing down the most important parts) and regulating processes (e.g., planning, monitoring, and checking the learning process with respect to learning goals). The deep, co-constructive, self-regulated, and autonomous approach to learning of this second group of students recalls the meaning-directed learning pattern shown by Vermunt (1998, 2005) among university students. Furthermore, our results are in line with findings in the literature (e.g., Meyer et al. 2009) that showed a relation between final secondary-school students’ academic outcomes and self-reported student motivation orientations (motivation beliefs and values). It is possible to find an analogy between the desirability of students “*At the helm*” (Profile 2), given that high scores in the same dimensions can be considered useful for adaptation in other contexts and for the ability to collaborate in groups in the work context (e.g., Konkola et al. 2007). Students “*At the helm*” (Profile 2) reached excellent school achievement in all school subjects: this confirms that the way through which students look at learning activities in a deep way is independent of the variables related either to the specific content of the subjects or to the variable constituted by the characteristics of the teacher who teaches them. Self-regulated students reach successful school outcomes because they are able to effectively plan learning aims, adopt learning strategies in a strategic way, monitor and revise their learning progress, and manage the learning environment with a feeling of self-confidence and motivation

(Zimmerman and Schunk 2011). This involves the ability to adapt the study process, being self-regulated and strategic to the difficulties and specificities of the different subjects. The clear association between students “*At the helm*” (Profile 2) and excellent school achievement leads us to think that their visions and beliefs about learning are coherent with their learning actions and studying activity which would likely act as mediators toward school achievement (e.g., Putarek and Pavlin-Bernardić 2019).

Our results describe middle-school students who are in a transitional phase of schooling. It would be useful to investigate in future research whether the combination of cognitive, metacognitive, and affective dimensions of learning orientation is interested by change in relation to the progression of the school path. A further promising area of research to develop would be checking the possible effect of years of schooling and gender on the relationship between profiles of learning orientations and school achievement by using larger samples. Considering the significant associations between profiles and school achievements in middle school, it would be interesting to examine whether and how profiles of learning orientation that are predictive of school achievements might change across school years. Information obtainable with a longitudinal research design. Furthermore, other types of external factors could provide a richer understanding of the processes influencing students’ school achievement. Information about teachers’ learning conceptions and teaching strategies applied, as well as prior students’ school achievement, might be particularly interesting to consider because they may be linked to middle-school achievement. Finally, although relying on actual student performance increases context validity, it constitutes a bias that future studies should overcome by also including standardized performance measurements (such as, large-scale performance assessment of INVALSI; see, Costanzo and Desimoni (2017).

Our findings encourage teachers, school psychologists, and educators to consider students’ learning orientations as potential powerful motivating factors. Considering the different profiles that emerged helps to better understand students’ strengths to be fostered and weaknesses to be eliminated by specific interventions. Specifically, supporting a deep, co-constructive, and self-regulated profile of learning orientations is functional to helping students in pursuit of excellent school achievement. Furthermore, the results of our study suggest that it is necessary to strengthen several aspects at the same time and it is not enough to strengthen only a single one. In particular, it is not enough that the student is self-regulated and has a strategic approach to study, but it would be useful to develop his/her ability to study in a group and to constructively compare him/herself with other students, asking questions or for help. It would be also important to foster his/her internal motivation and able to use the teacher’s input positively, considering the teacher a safe guide. Finally, a successful student shows the capacity to transfer knowledge into behaviors in the context of his/her learning experience. It is important to reiterate that it is the close relationship and integration in the same person of these aspects that turn a student into a student who achieves excellent results. Teachers and classroom climate might also play a decisive role in promoting middle-school students’ identity development. Work on middle-school students’ learning orientations might configure as an opportunity to sustain their exploration by reflecting upon previous self-representations and experiencing new identity positions. Furthermore, parental and teacher behavior might serve as opportunities to sustain students’ commitment and motivational processes (e.g., Puklek Levpušček and Zupančič 2009), for example helping them to find a link between what they learn in school and their personal values and expectations.

Funding Open access funding provided by Università degli Studi di Firenze within the CRUI-CARE Agreement.

Declarations

Conflict of interest The authors declare no competing interests.

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Giulia Vettori. Department of Education, Languages, Intercultures, Literatures and Psychology, University of Florence, 12 Via di San Salvi, Building 26 (Psychology Section), Florence 50135, Italy. E-mail: giulia.vettori@unifi.it

Current theme of research: Students' conceptions of learning and their relations with learning outcomes; Literacy processes; Oral and Written language; Spelling; Text-level processes; Development of theory of mind.

Most relevant publications in the field of Psychology of Education:

- Vettori, G., Vezzani, C., Bigozzi, L., Pinto, G. (2020). Cluster profiles of university students' conceptions of learning according to gender, educational level, and academic disciplines. *Learning and Motivation*, 70, 101628. Doi: 10.1016/j.lmot.2020.101628.
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Claudio Vezzani. Department of Education, Languages, Intercultures, Literatures and Psychology, University of Florence, 12 Via di San Salvi, Building 26 (Psychology Section), Florence 50135, Italy. E-mail: claudio.vezzani@gmail.com

Current theme of research: Conceptions of learning; Instrument validation study; Longitudinal paths of literacy skills; Cluster analysis; Research methodology; Psychometry

Most relevant publications in the field of Psychology of Education:

- Donfrancesco, R., Vezzani, C., Pinto, G., Bigozzi, L., Dibenedetto, A., Melegari, M. G., ... & Tambelli, R. (2019). The validation of the Free Fantasy Questionnaire for Children and Adolescents: from Imaginary Playmate to "Dreamtime". *Frontiers in psychology*, 10, 1343.
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Lucia Bigozzi. Department of Education, Languages, Intercultures, Literatures and Psychology, University of Florence, 12 Via di San Salvi, Building 26 (Psychology Section), Florence 50135, Italy. E-mail: lucia.bigozzi@unifi.it

Current theme of research: Development of metacognition and theory of mind; Communicative and linguistic development, with special interest in lexical competence development and its relations with reading comprehension; Literacy processes; Learning disabilities; Dyslexia and predictors; Spelling disorders and predictors; Attention Deficit Hyperactivity Disorder; Psychodiagnosis; Learning (Creativity, metaknowledge, learning conceptions) in the educational contexts; School interventions; Teaching and learning processes; Effectiveness of teaching methods.

Most relevant publications in the field of Psychology of Education:

- Bigozzi, L., Pezzica, S., & Grazi, A. (2018). Attentional processes predictive of reading in second and third classes the role of selective/focused attention and planning. *Educational Research Applications*, vol. 2018, 1-10, ISSN:2575-7032
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- Giuliana Pinto.** Department of Education, Languages, Intercultures, Literatures and Psychology, University of Florence, 12 Via di San Salvi, Building 26 (Psychology Section), Florence 50135 (Italy). E-mail: giuliana.pinto@unifi.it

Current theme of research: The development of literacy processes; The development of symbolic and notational systems; Learning to write; Comprehension and production of written text; Learning processes in formal and informal contexts; Children's conceptions of interpersonal relationships.

Most relevant publications in the field of Psychology of Education:

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