REVIEW OF PSYCHOPEDAGOGY
REVISTA DE PSIHOPEDAGOGIE

ISSN 2784 – 3092
ISSN – L 2784 - 3092
psychopedagogy.unibuc.ro

DOI: https://doi.org/10.56663/rop.v14i1.90

Universal Design for Learning (UDL) in Romanian Dual Education: The Role of Basic Psychological Needs and Self-Perception in Student Engagement

Petronela Piticari[1]
Alina Chiracu[2]
Doru Vlad Popovici[3]

Abstract

This study examined the role of Universal Design for Learning (UDL) in shaping engagement among Romanian dual-education students. A sample of 433 adolescents (aged 15–19) completed measures of perceived UDL principles implementation, basic psychological need satisfaction, self-perception, and learning engagement/disengagement. Results showed that UDL implementation positively predicted student engagement, but also, unexpectedly, learning disengagement. UDL was strongly associated with satisfaction of autonomy, competence, and relatedness needs, as well as with students' self-perception. Mediation analyses indicated that psychological need satisfaction, especially competence, explained the link between UDL and both engagement and disengagement, while self-perception mediated only the relation with disengagement. These findings suggest that UDL has meaningful motivational benefits in dual-education contexts, but inconsistent or unbalanced implementation may contribute to ambivalent outcomes. Strengthening coherent, autonomy-supportive, and competence-enhancing practices is essential for maximizing the positive impact of UDL on adolescent learners.

Keywords: Universal Design for Learning (UDL), learning engagement and disengagement, basic psychological needs, self-perception, dual education

Introduction

Dual education in Romania is defined by two main components: (i) the duality of learning spaces - schools and training companies - which share responsibility for providing both theoretical and practical training for adolescents and young adults, and (ii) the duality of stakeholders - public and private - who jointly organize and implement policies and practices in vocational and technical education.

The term dual education is often used interchangeably with work-based learning, alternance training, or apprenticeship programs, as it combines school-based vocational education with company-based apprenticeships within the same curriculum (UNESCO, 2012). In partner companies, students have the opportunity to apply in practice the theoretical principles learned in school. Thus, dual education refers to periods in which learning in an educational institution is combined with learning at the workplace.

Dual education supports students' transition from school to employment and may be a solution for facilitating this process - especially in the current Romanian context, where the demand for moderately skilled technical workers is significantly higher than the supply. The

[1] PhD candidate, University of Bucharest, Faculty of Psychology and Educational Science, Romania
[2] Lecturer PhD, University of Bucharest, Faculty of Psychology and Educational Science, Romania
[3] Professor PhD, University of Bucharest, Faculty of Psychology and Educational Science, Romania
Corresponding author: Alina Chiracu
email: alina.chiracu@fpse.unibuc.ro

ISSN 2784 – 3092
ISSN – L 2784 - 3092
psychopedagogy.unibuc.ro

existing labor shortage could be mitigated through dual education, which allows companies to participate directly in training future employees and to select competent workers. Any lower-secondary graduate up to age 26 may enter the dual system, choose a qualification, and train within a company; at the same time, students may continue high school studies in evening programs and, after passing the baccalaureate exam, pursue higher education (CCIR, 2024).

Based on this background, the present study investigates variables associated with the implementation of Universal Design for Learning (UDL) principles in dual-education teaching practices. Our goal is to examine the relationship between UDL implementation and students' learning engagement. Considering the dual nature of this educational system - combining theoretical and practical learning while supporting adolescents' entry into the labor market - we also aim to test whether teaching practices, as perceived by students, are related to satisfaction of basic psychological needs (autonomy, competence, relatedness) and to students' self-perception.

The dynamic relations among UDL, basic psychological need satisfaction, self-perception, and learning engagement have received increasing attention in educational psychology, especially with regard to adolescent development and access to meaningful professional pathways. Understanding these relationships is essential for designing inclusive learning environments that foster both personal and professional growth. UDL provides a robust framework for inclusive education, encouraging the satisfaction of students' basic psychological needs, strengthening self-perception, and enhancing learning engagement.

UDL and learning engagement

Engagement includes behavioral, cognitive, and emotional components, all of which contribute to meaningful learning experiences (Fredricks et al., 2004). Behavioral engagement refers to students' participation and effort in school activities; emotional engagement reflects their interest and emotional attachment to school; and cognitive engagement involves investing in understanding complex ideas and using self-regulation. UDL's focus on providing multiple means of engagement aligns closely with these dimensions, giving students opportunities to connect more deeply with learning materials, develop motivation, and build deeper understanding.

Research shows that UDL's emphasis on engagement encourages stronger behavioral and emotional investment in learning. Katz and Assor (2007) found that students show higher engagement when they experience autonomy and competence in the classroom. By offering choices and multiple ways to demonstrate learning, UDL can meet these psychological needs, leading to greater involvement in learning. Additionally, UDL's flexibility allows students to approach learning in ways that match their strengths, increasing their confidence and willingness to participate.

A number of studies have shown that UDL has positive effects on adolescent engagement across educational settings. For example, Courey et al. (2013) found that structuring high school math lessons using UDL significantly improved student engagement and understanding. Similarly, Katz (2013) reported that middle and high school teachers who implemented UDL principles observed increased student engagement and improved performance, with students feeling more interested in and connected to learning activities.

Furthermore, by increasing engagement, UDL may serve as a protective factor against burnout and disengagement. School burnout, which is common among adolescents, is often linked to academic and social pressures and to unmet needs for autonomy and competence (Salmela-Aro & Upadyaya, 2014).

ISSN 2784 – 3092
ISSN – L 2784 - 3092
psychopedagogy.unibuc.ro

Based on these findings, we aim to examine whether UDL implementation is associated with learning engagement among students in dual education. We therefore propose the following hypotheses:

H1. *UDL implementation is positively associated with learning engagement among students in dual education*.

H2. *UDL implementation is negatively associated with learning disengagement among students in dual education*.

UDL and Basic Psychological Need Satisfaction

Rooted in Self-Determination Theory (SDT), the concept of basic psychological needs highlights three essential human needs: autonomy, competence, and relatedness (Deci & Ryan, 2000). Autonomy refers to feeling in control of one's actions; competence reflects feeling capable and effective; and relatedness refers to feeling connected to others. These needs are fundamental for optimal functioning. During adolescence - a developmental stage marked by major cognitive, social, and emotional changes - satisfying these needs becomes especially important. When adolescents feel that their school environment supports these needs, they tend to be more motivated, more engaged, and experience greater well-being, which are all linked to improved academic performance (Ryan & Deci, 2000).

Research shows that meeting these needs in educational settings increases motivation, well-being, and student engagement (Vansteenkiste et al., 2004). By offering multiple means of representation, action, and engagement, UDL naturally supports the satisfaction of basic psychological needs. For example, providing multiple ways for students to express their learning can improve their sense of competence, while offering choice can support autonomy. Thus, implementing UDL principles can directly contribute to creating a motivating and supportive learning environment for students (Katz & Assor, 2007).

UDL's emphasis on flexibility and personalization enables students to engage with curriculum activities in ways that feel meaningful and relevant, which directly supports autonomy. By offering various ways to access information and demonstrate knowledge, UDL encourages students to choose how they learn best, giving them a greater sense of control over their learning process (Katz & Assor, 2007). This autonomy-supportive environment is especially important in adolescence, when autonomy contributes significantly to identity development and self-perception (Stefanou et al., 2004).

UDL also supports competence by providing multiple means of engagement, giving students access to a variety of resources that facilitate understanding. Its flexibility allows learners to work at their own pace, use tools suited to their level, and gradually build skills and knowledge. These practices strengthen students' sense of effectiveness (Meyer et al., 2014). Adolescents who feel competent are more likely to engage in challenging tasks and persist when obstacles arise (Fredricks et al., 2004).

Relatedness is supported through UDL's emphasis on inclusive classroom environments, where students are valued and respected regardless of learning style or ability. Such inclusive practices help students feel accepted and connected to peers and teachers, building a sense of belonging that fosters social and emotional development (Katz, 2013). Adolescents who feel connected to their school community are more motivated and more willing to engage positively in academic and social contexts (Ryan & Deci, 2000).

Studies confirm that UDL can contribute to satisfying adolescents' psychological needs in school. For example, Katz and Porath (2011) found that students in UDL-based classrooms

ISSN 2784 – 3092
ISSN – L 2784 - 3092
psychopedagogy.unibuc.ro

reported higher engagement, autonomy, and competence. By integrating choice, flexibility, and inclusive practices, UDL classrooms give students the structure needed to take control of their learning, develop skills at their own pace, and feel supported by teachers and peers.

Based on this framework, we aim to examine whether UDL implementation is associated with basic psychological need satisfaction among students in dual education. We propose the following hypotheses:

H3. *UDL implementation is positively associated with basic psychological need satisfaction among students in dual education*.

H3a. *UDL implementation is positively associated with autonomy satisfaction*.

H3b. *UDL implementation is positively associated with competence satisfaction*.

H3c. *UDL implementation is positively associated with relatedness satisfaction*.

UDL and Self-Perception

Self-perception - how adolescents understand and evaluate their own abilities and characteristics - is an important factor in their motivation and academic performance. A positive self-perception is linked to academic self-efficacy, high-quality social relationships, and greater resilience (Harter, 2012). UDL can strengthen self-perception by allowing students to demonstrate their abilities in different ways, which supports the development of a positive academic and social identity. Self-perception is also closely connected to the satisfaction of basic psychological needs. Adolescents who feel competent, autonomous, and connected to others are more likely to develop a positive sense of self, which in turn promotes engagement and a growth-oriented mindset (Bandura, 1997). Research shows that learning environments that support autonomy, competence, and relatedness - such as those shaped by UDL - can improve adolescents' self-perception and positively influence both motivation and engagement (Van Petegem et al., 2008).

Self-perception includes students' beliefs about their abilities, competencies, and identity. It plays a central role in motivation and engagement and develops rapidly during adolescence. Through its flexible and personalized approach, UDL helps students align learning activities with their interests, strengths, and skills, giving them opportunities to succeed and build self-efficacy and a sense of belonging (Hall et al., 2012).

Self-perception is a multifaceted construct that includes self-concept, self-esteem, and self-efficacy, all of which develop significantly during adolescence and contribute to the formation of identity (Harter, 2012). Positive self-perception is associated with higher academic achievement, increased motivation, and resilience (Marsh & Craven, 2006). Conversely, negative self-perception can lead to disengagement, anxiety, and avoidance of academic challenges (Zimmerman & Cleary, 2006).

Supportive school practices that recognize students' abilities and build their confidence are essential for healthy self-perception. UDL principles of flexibility and inclusion help teachers design learning experiences that are personally meaningful for students, allowing them to recognize their strengths, take ownership of their learning, and feel competent in school activities (Katz & Porath, 2011).

Based on these considerations, we aim to examine whether the implementation of UDL principles in dual education contributes to improving students' self-perception. We therefore propose the following hypothesis:

H4. *UDL implementation is positively associated with self-perception among students in dual education*.

The Present Study

ISSN 2784 – 3092
ISSN – L 2784 - 3092
psychopedagogy.unibuc.ro

The present study aims to provide a detailed portrait of students enrolled in dual education programs in Brașov County and to examine the contribution of UDL implementation to their learning engagement. It is important to note that the teachers who facilitated this study participated in a professional training program focused on UDL principles. After completing the training, they applied these principles in their teaching practice. The participating students therefore experienced an entire school year in which their classes were taught by UDL-trained teachers.

The study examined several key variables: students' perceptions of UDL implementation, satisfaction of basic psychological needs, self-perception, and learning engagement versus disengagement. These variables, and the relationships among them, offer valuable insights into teaching quality and its consequences within dual education. Given the strong conceptual links between these constructs, we aim to test whether basic psychological need satisfaction and self-perception mediate the relationship between UDL implementation and student engagement. This leads to our final hypothesis:

H5. *Basic psychological need satisfaction and self-perception mediate the relationship between UDL implementation and learning engagement among students in dual education*.

Method

Participants and Procedure

A total of 433 students enrolled in dual education programs participated in the study. Their ages ranged from 15 to 19 years (M = 16.45, SD = 1.00). The sample included 242 boys (56%) and 191 girls (44%). Of these, 104 students (24%) came from single-parent families and 308 (76%) from two-parent families. Regarding their area of residence, 193 students (46%) were from rural areas and 240 (54%) from urban areas. In terms of grade level, 197 were in 9th grade (45%), 132 in 10th grade (30%), and 104 in 11th grade (25%).

Convenience sampling was used. Students were informed about the study by their teachers and were invited to participate by completing a set of questionnaires. A total of 500 invitations were distributed, and 433 students agreed to participate (87%). After students provided their assent, parental consent was obtained for those who were minors, followed by the signing of informed consent and GDPR forms. Participants were assured of data confidentiality and the anonymization of responses. Ethical approval for the study was obtained from the Ethics Committee of the University of Bucharest.

The questionnaires were distributed online via Google Forms. Data were organized in Excel files and processed using IBM SPSS 24 (IBM Corp., 2016) and the medmod module in Jamovi (The Jamovi Project, 2022). The estimated time required to complete the questionnaires was approximately 30 minutes.

Instruments

Sociodemographic data were collected using a short set of questions regarding gender, age, grade level, and area of residence.

UDL implementation was measured using the UDL Questionnaire for Students, developed by the author of this study and previously used in several studies in a slightly modified form. The instrument contains 16 items, four for each of the four UDL principles: use of technology, differentiated instruction, cooperative learning, and individualized assessment. Responses are given on a five-point Likert scale ranging from 1 (to a very small extent) to 5 (to a very large extent). Example items include: "Teachers allow us to use technology (laptop, computer, tablet,

ISSN 2784 – 3092
ISSN – L 2784 - 3092
psychopedagogy.unibuc.ro

smartphone, etc.) to complete some class activities or to take tests or assessments," and "Teachers organize groups of up to four students in which they discuss the main ideas of the lesson."

Basic psychological need satisfaction was measured using the Basic Psychological Needs Satisfaction Questionnaire for Students (Jenkins-Guarnieri et al., 2015). The instrument consists of 13 items assessing autonomy, competence, and relatedness satisfaction. Responses are given on a five-point Likert scale from 1 (not at all true) to 5 (very true). Example items include: "I have the freedom to express my ideas and opinions at school," and "Teachers and classmates tell me that I am good at what I do at school."

Self-perception was measured using the Self-Perception Profile for Adolescents (Harter, 2012). This instrument includes 45 items assessing eight competence domains (scholastic competence, social competence, athletic competence, job competence, physical appearance, close friendships, conduct, and romantic appeal) as well as global self-worth. Items are rated on a four-point Likert scale, where 1 (not like me at all) and 4 (very much like me). Example items include: "Some teenagers are good at all kinds of sports (others are not good at all kinds of sports)," and "Some teenagers do things that get them into trouble (others do not do things that get them into trouble)." To respond, participants first choose the category they identify with and then indicate the degree to which it applies to them.

Engagement vs. Disengagement with Learning was measured using the Engagement vs. Disengagement with Learning Student-Report Scale (Skinner et al., 2008). The instrument contains 25 items measuring behavioral engagement, emotional engagement, behavioral disengagement, and emotional disengagement (boredom, anxiety, discomfort, frustration). Responses are provided on a five-point Likert scale ranging from 1 (never) to 5 (always). Example items include: "I take part in class discussions," and "I get bored when the teacher explains a new lesson."

Design

The present study used a cross-sectional, correlational, exploratory design.

Findings and discussion

Descriptive statistics

Means, standard deviations, Cronbach Alpha coefficients and Pearson correlations among aggregate variables are presented in Table 1.

Table 1. Descriptive statistics

	M	SD	α	UDL	AUT	COM	REL	SPPA	IMIN	DEIN
UDL	51.24	13.15	.93	1						
AUT	14.38	3.49	.74	.48**	1					
COM	16.43	3.89	.73	.43**	.57**	1				
REL	13.21	4.06	.80	.34**	.52**	.53**	1			
SPPA	14.16	2.30	.78	.34**	.40**	.48**	.51**	1		
IMIN	14.21	3.39	.90	.42**	.56**	.66**	.50**	.42**	1	
DEIN	23.03	6.54	.89	-.20**	-.38**	-.57**	-.40**	-.47**	-.44**	1

Note: **. p < .01.
UDL – Universal Design for Learning principles, AUT – autonomy, COM – competence, REL – relatedness, SPPA – self-perception, IMIN – learning engagement, DEIN – learning disengagement.

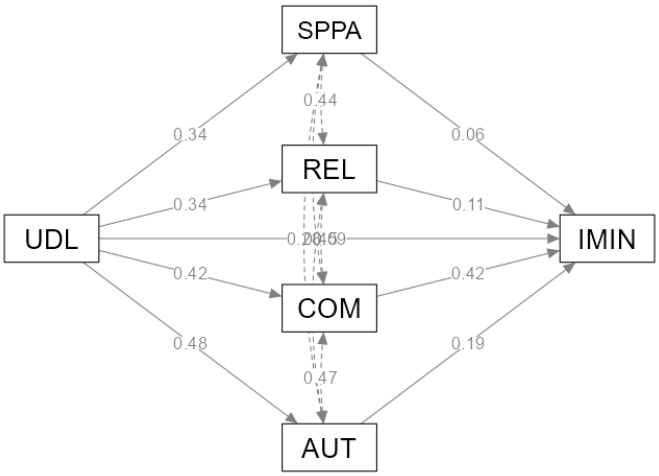
Skewness and kurtosis ranged between (-1, 1), reflecting a normal data distribution.

ISSN 2784 – 3092
ISSN – L 2784 - 3092
psychopedagogy.unibuc.ro

Hypotheses testing

To test these hypotheses, two multiple mediation analyses were conducted, with UDL implementation as the predictor; learning engagement and learning disengagement as the dependent variables (alternatively); and basic psychological need satisfaction (autonomy, competence, relatedness) and self-perception as the mediating variables.

Figure 1. Mediation model for learning engagement



Note: UDL – Universal Design for Learning principles, AUT – autonomy, COM – competence, REL – relatedness, SPPA – self-perception, IMIN – learning engagement.

Table 2. Direct and indirect effects of UDL on learning engagement

				95% C.I. (a)				
Type	**Effect**	**Estimate**	**SE**	**Lower**	**Upper**	**β**	**z**	**p**
Indirect	UDL ⇒ AUT ⇒ IMIN	.02	.01	.01	.04	.09	4.00	.00
	UDL ⇒ COM ⇒ IMIN	.05	.01	.03	.06	.18	6.67	.00
	UDL ⇒ REL ⇒ IMIN	.01	.00	.01	.02	.04	2.39	.02
	UDL ⇒ SPPA ⇒ IMIN	.01	.00	-.00	.01	.02	1.53	.13
Component	UDL ⇒ AUT	.13	.01	.10	.15	.48	11.34	.00
	AUT ⇒ IMIN	.19	.04	.10	.27	.19	4.27	.00
	UDL ⇒ COM	.12	.01	.10	.15	.42	9.70	.00
	COM ⇒ IMIN	.37	.04	.29	.44	.42	9.20	.00
	UDL ⇒ REL	.11	.01	.08	.13	.34	7.58	.00
	REL ⇒ IMIN	.09	.04	.02	.16	.11	2.51	.01
	UDL ⇒ SPPA	.06	.01	.05	.08	.34	7.58	.00
	SPPA ⇒ IMIN	.09	.06	-.02	.21	.06	1.56	.12
Direct	UDL ⇒ IMIN	.02	.01	.01	.04	.09	2.32	.02
Total	UDL ⇒ IMIN	.11	.01	.09	.13	.42	9.66	.00

Note: UDL – Universal Design for Learning principles, AUT – autonomy, COM – competence, REL – relatedness, SPPA – self-perception, IMIN – learning engagement

The results show that UDL implementation is significantly and positively associated with students' learning engagement in dual education, b = .02, CI95%(.01, .04), β = .09, Z = 2.32, p <

ISSN 2784 – 3092
ISSN – L 2784 - 3092
psychopedagogy.unibuc.ro

.05. UDL implementation is also significantly and positively associated with satisfaction of all three basic psychological needs: autonomy, b = .13, CI95%(.10, .15), β = .48, Z = 11.34, p < .01; competence, b = .12, CI95%(.10, .15), β = .42, Z = 9.70, p < .01; and relatedness, b = .11, CI95%(.08, .13), β = .34, Z = 7.58, p < .01, as well as with students' self-perception, b = .06, CI95%(.05, .08), β = .34, Z = 7.58, p < .01.

Furthermore, satisfaction of basic psychological needs is positively associated with students' learning engagement: autonomy satisfaction, b = .19, CI95%(.10, .27), β = .19, Z = 4.27, p < .01; competence satisfaction, b = .37, CI95%(.29, .44), β = .42, Z = 9.20, p < .01; and relatedness satisfaction, b = .09, CI95%(.02, .16), β = .11, Z = 2.51, p < .05.

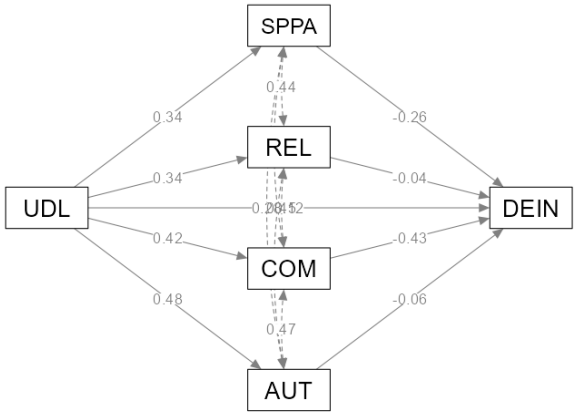
Self-perception is not significantly associated with learning engagement, b = .09, CI95%(-.02, .21), β = .06, Z = 1.56, p = .12.

Self-perception does not mediate the relationship between UDL implementation and learning engagement, b = .01, CI95%(-.00, .01), β = .02, Z = 1.53, p = .13.

However, basic psychological need satisfaction does mediate this relationship: autonomy satisfaction: b = .02, CI95%(.01, .04), β = .09, Z = 4.00, p < .01, competence satisfaction: b = .05, CI95%(.03, .06), β = .18, Z = 6.67, p < .01, relatedness satisfaction: b = .01, CI95%(.01, .02), β = .04, Z = 2.39, p < .05.

The total effect of UDL implementation, basic psychological need satisfaction, and self-perception on learning engagement is significantly positive, b = .11, CI95%(.09, .13), β = .42, Z = 9.66, p < .05. These findings support our hypotheses, except for the mediating role of self-perception, which was not confirmed.

Figure 2. Mediation model for learning disengagement



Note: UDL – Universal Design for Learning principles, AUT – autonomy, COM – competence, REL – relatedness, SPPA – self-perception, DEIN – learning disengagement

ISSN 2784 – 3092
ISSN – L 2784 - 3092
psychopedagogy.unibuc.ro

Table 3. Direct and indirect effects ov UDL on learning disengagement

Type	Effect	Estimate	SE	95% C.I. (a) Lower	95% C.I. (a) Upper	β	z	p
Indirect	UDL ⇒ AUT ⇒ DEIN	-.02	.01	-.04	.01	-.03	-1.26	.21
	UDL ⇒ COM ⇒ DEIN	-.09	.01	-.12	-.06	-.18	-6.40	.00
	UDL ⇒ REL ⇒ DEIN	-.01	.01	-.02	.01	-.01	-.83	.40
	UDL ⇒ SPPA ⇒ DEIN	-.04	.01	-.06	-.03	-.09	-4.57	.00
Component	UDL ⇒ AUT	.13	.01	.10	.15	.48	11.34	.00
	AUT ⇒ DEIN	-.12	.09	-.31	.07	-.06	-1.27	.20
	UDL ⇒ COM	.12	.01	.10	.15	.42	9.70	.00
	COM ⇒ DEIN	-.73	.09	-.90	-.56	-.43	-8.52	.00
	UDL ⇒ REL	.11	.01	.08	.13	.34	7.58	.00
	REL ⇒ DEIN	-.07	.08	-.22	.09	-.04	-.84	.40
	UDL ⇒ SPPA	.06	.01	.05	.08	.34	7.58	.00
	SPPA ⇒ DEIN	-.74	.13	-.99	-.48	-.26	-5.72	.00
Direct	UDL ⇒ DEIN	.06	.02	.01	.10	.12	2.61	.01
Total	UDL ⇒ DEIN	-.10	.02	-.15	-.05	-.20	-4.28	.00

Note: UDL – Universal Design for Learning principles, AUT – autonomy, COM – competence, REL – relatedness, SPPA – self-perception, DEIN – learning disengagement

Surprisingly, UDL implementation is significantly and positively associated with learning disengagement among students in dual education, b = .06, CI95%(.01, .10), β = .12, Z = 2.61, p < .05. At the same time, UDL implementation is significantly and positively associated with satisfaction of all three basic psychological needs: autonomy, b = .13, CI95%(.10, .15), β = .48, Z = 11.34, p < .01; competence, b = .12, CI95%(.10, .15), β = .42, Z = 9.70, p < .01; relatedness, b = .11, CI95%(.08, .13), β = .34, Z = 7.58, p < .01; and also with students' self-perception, b = .06, CI95%(.05, .08), β = .34, Z = 7.58, p < .01.

Regarding basic psychological need satisfaction, only competence satisfaction is negatively associated with learning disengagement, b = –.73, CI95%(–.90, –.56), β = –.43, Z = –8.52, p < .01. Satisfaction of autonomy, b = –.12, CI95%(–.31, .07), β = –.06, Z = –1.27, p = .20, and satisfaction of relatedness, b = –.07, CI95%(–.22, .09), β = –.04, Z = –.84, p = .40, are not significantly associated with disengagement.

Self-perception is significantly and negatively associated with learning disengagement, b = –.74, CI95%(–.99, –.48), β = –.26, Z = –5.72, p < .01.

Among the three basic psychological needs, only competence satisfaction mediates the relationship between UDL implementation and learning disengagement, b = –.09, CI95%(–.12, –.06), β = –.18, Z = –6.40, p < .01. Autonomy satisfaction, b = –.02, CI95%(–.04, .01), β = –.03, Z = –1.26, p = .21, and relatedness satisfaction, b = –.01, CI95%(–.02, .01), β = –.01, Z = –.83, p = .40, do not mediate this relationship.

ISSN 2784 – 3092
ISSN – L 2784 - 3092
psychopedagogy.unibuc.ro

Self-perception does mediate the association between UDL implementation and learning disengagement, b = –.04, CI95%(–.06, –.03), β = –.09, Z = –4.57, p < .01.

The total effect of UDL implementation, basic psychological need satisfaction, and self-perception on learning disengagement is significantly negative, b = –.10, CI95%(–.15, –.05), β = –.20, Z = –4.28, p < .01. These results partially support our hypotheses.

Discussion

The purpose of this study was to examine the relationships between UDL implementation among students in dual education, basic psychological need satisfaction, self-perception, and learning engagement/disengagement. Through descriptive analyses, we aimed to obtain an updated "portrait" of dual-education students from the perspective of these variables.

Regarding UDL implementation, students' scores indicate a moderate perception of how consistently these principles are applied in teaching, suggesting a relatively limited integration of UDL into instructional practice. The highest emphasis appears to be on the use of technology, which may reflect a shift toward employing more modern instructional materials.

For self-perception, the highest domain score was job competence, which is understandable given that students are enrolled in dual education programs where the focus is on hands-on activities, practical training, and learning a trade. High levels of global self-worth were also observed, indicating that students generally feel pleased and satisfied with who they are. The lowest score emerged for romantic attractiveness, meaning that students do not view themselves as highly appealing to potential romantic partners—however, this does not seem to diminish their overall self-esteem.

In terms of basic psychological need satisfaction, competence showed the highest levels, which aligns with the nature of dual education, where mastering technical skills and developing craftsmanship are central goals. With respect to learning engagement, students' scores were moderate and relatively similar for both engagement and disengagement. When examining disengagement more closely, frustration-related disengagement appeared most prominent, followed by disengagement associated with discomfort.

Through hypotheses H1 and H2, we aimed to test whether UDL implementation is associated with students' learning engagement versus disengagement. The results showed that UDL is positively associated with both engagement and disengagement. The positive association with engagement is expected, as UDL principles are designed to address the learning needs of a diverse student population. Flexibility, inclusiveness, and accessibility aim to adapt instruction to students' varied learning styles, abilities, and interests. UDL therefore plays an important role in enhancing adolescents' motivation by targeting psychological factors that influence their engagement, participation, and emotional and behavioral investment in learning.

Students in dual education are in adolescence, a stage marked by a strong desire for independence. UDL principles may effectively respond to this developmental need by giving students greater control over their learning (Schunk et al., 2008).

The positive association between UDL and disengagement, however, is less intuitive and requires deeper interpretation. One possible explanation is that although UDL principles were introduced to teachers through professional development, the degree to which they were effectively implemented may have varied substantially across classrooms. When instructional practices are only partially aligned with UDL principles—or when teachers adopt surface-level strategies without fully restructuring learning environments—students may experience inconsistency or

ISSN 2784 – 3092
ISSN – L 2784 - 3092
psychopedagogy.unibuc.ro

ambiguity in instructional expectations. Such discrepancies can, in turn, contribute to frustration or withdrawal, particularly among adolescents who depend on predictable structures and clear instructional scaffolding.

Another interpretation is that dual education students face unique contextual stressors related to balancing school and workplace demands. Even when UDL practices are present, the combined pressures of academic coursework and vocational training may generate cognitive or emotional overload, contributing to certain forms of disengagement. In this sense, UDL may enhance engagement by supporting autonomy and competence, while disengagement may still emerge in contexts where workload, performance pressure, or workplace-related stress surpass students' coping resources.

Through hypotheses H3 and H4, we examined how UDL relates to basic psychological need satisfaction and self-perception. Consistent with the Self-Determination Theory (Deci & Ryan, 2000), the findings indicate that UDL implementation is strongly and positively associated with autonomy, competence, and relatedness satisfaction. This suggests that UDL-based instructional practices—such as offering choices, using differentiated teaching strategies, and fostering collaborative learning—may contribute to students' perceptions of agency, mastery, and belonging. The positive association between UDL and self-perception aligns with earlier research demonstrating that supportive, flexible learning environments enhance students' academic self-concepts and global self-worth (Van Petegem et al., 2008; Katz & Porath, 2011).

With respect to the mediational hypotheses (H5), the results revealed a nuanced pattern. For learning engagement, basic psychological need satisfaction—but not self-perception—mediated the relationship between UDL and engagement. This is consistent with SDT, which posits that autonomy, competence, and relatedness directly energize students' willingness to invest effort and persist in learning tasks. Self-perception, although related to well-being and motivation, may represent a broader intrapersonal construct that does not directly translate into moment-to-moment engagement behaviors.

For disengagement, the results partially supported our expectations: competence satisfaction and self-perception both mediated the relationship between UDL and disengagement, whereas autonomy and relatedness did not. This suggests that students who feel more competent and who have a stronger sense of self are less likely to withdraw, become frustrated, or disconnect emotionally from learning activities. Competence appears to play a particularly central role in reducing disengagement—a finding that aligns with previous literature emphasizing the protective effects of perceived mastery in vocational and technical learning environments (Fredricks et al., 2004; Meyer et al., 2014).

Finally, the total effects indicate that UDL, psychological need satisfaction, and self-perception together significantly reduce disengagement and increase engagement, reinforcing the idea that UDL has the potential to shape learning outcomes through both direct and indirect pathways. However, the mixed findings—especially the unexpected positive association between UDL and disengagement—highlight the need for a closer examination of how UDL is implemented in dual education contexts and how students interpret these practices amidst the combined pressures of academic and vocational training.

Another important contribution of UDL to learning engagement is its emphasis on scaffolding, meaning the gradual and adaptive support offered to students according to their individual needs (Rose & Dalton, 2009). When students feel supported and capable of managing tasks, they are more likely to persist and remain engaged, even when facing difficulties (Hattie &

ISSN 2784 – 3092
ISSN – L 2784 - 3092
psychopedagogy.unibuc.ro

Timperley, 2007). Scaffolding is particularly relevant in adolescence—a period of major cognitive, emotional, and social change—and even more so for students in dual education, who navigate both academic and workplace demands.

UDL also promotes diverse instructional strategies, such as multimedia, collaborative learning, and flexible assessment methods. These approaches align well with the varied preferences of dual-education students who alternate between theoretical and practical learning. Adolescents value relevance and personalization (Fredricks et al., 2004), and UDL increases engagement by connecting abstract concepts with real-life and vocational applications. Multimedia resources, for example, can capture attention and deepen understanding through multimodal presentation (Sweller, 1988).

UDL also enhances emotional engagement, helping students feel valued and supported (Meyer et al., 2014). By fostering positive emotions, a welcoming learning climate, and resilience, UDL strengthens students' emotional connection to school. This is essential in adolescence, a time when students seek validation and belonging (Skinner et al., 2008). When UDL promotes feelings of competence and inclusion, students tend to invest more effort in learning.

The unexpected positive link between UDL and disengagement may reflect misinterpretations or misuse of UDL principles by dual-education students. Because they divide their time between school and work, too much flexibility or autonomy may lead some students to procrastinate or underestimate academic responsibilities. Technology use, for instance, may distract rather than support learning. Individualized assessment might be perceived as an opportunity to request easier tasks. Close teacher–student relationships may also be misunderstood as permission to relax standards or deadlines.

These findings highlight the need for a balance between autonomy and structure. Many dual-education students - especially younger ones - come from traditional lower-secondary classrooms with highly directive teaching. Sudden exposure to flexible, modern methods may be confusing or interpreted as reduced accountability. Moreover, UDL implementation appears to be inconsistent across teachers, which may create mixed signals for students rather than coherent learning support.

Regarding H3, the results show that UDL is positively associated with all three basic psychological needs—autonomy, competence, and relatedness. This is unsurprising, given that UDL emphasizes flexible materials, instructional methods, and assessments. Dual-education students choose their vocational path and typically learn skills directly relevant to future employment, which naturally supports autonomy and competence. The dual structure of school and workplace also promotes relatedness—through cooperative learning, teacher relationships, and interactions with workplace mentors.

Previous studies confirm these patterns. Katz (2013) showed that UDL practices, such as choice in assessment and varied demonstration of learning, enhance control, self-efficacy, and autonomy. Jimenez et al. (2020) found that UDL improves students' sense of belonging and social connectedness, especially among those with special educational needs. Similarly, Novak and Rodriguez (2016) reported that university students felt more competent and autonomous in UDL-aligned classes.

Regarding H4, the study found a strong positive link between UDL and self-perception. UDL's emphasis on valuing students, recognizing their strengths, and offering flexible ways to show competence appears to reinforce a realistic and positive self-view. Work competence emerged as the most strongly associated dimension, consistent with the vocational nature of dual

ISSN 2784 – 3092
ISSN – L 2784 - 3092
psychopedagogy.unibuc.ro

education. Exposure to real workplace environments likely helps students develop confidence in their abilities and career paths. Research supports this: students taught through UDL show higher self-efficacy and self-concept, particularly those who struggled in traditional settings (Katz & Sugden, 2013; McGhie-Richmond & Sung, 2013; Meyer et al., 2014; Rao et al., 2014).

Overall, UDL's flexibility helps build a strong and healthy self-perception, which in turn supports academic and personal development.

Finally, H5 examined whether psychological need satisfaction and self-perception mediate the relationships between UDL and engagement/disengagement. All three needs mediated the relationship between UDL and engagement, with competence showing the strongest effect. Competence was also the only need that mediated the relationship between UDL and disengagement. This likely reflects the central role of skill mastery in dual education: when students feel competent, they are less likely to withdraw and more likely to persist.

Self-perception did not mediate engagement, but it did mediate disengagement. Students with stronger self-perception do not necessarily engage more, but they are less likely to disengage. The combined model shows that UDL ultimately increases engagement and reduces disengagement when psychological mechanisms are taken into account.

These results suggest that while UDL's flexibility may occasionally create room for disengagement, psychological need fulfillment and strong self-perception counterbalance this risk, especially in a vocational context where competence development is highly salient.

Conclusions

This study examined the role of UDL in increasing learning engagement among students in dual education, with a focus on the mediating effects of basic psychological need satisfaction and self-perception. The findings show that implementing UDL principles benefits adolescents not only by enhancing engagement, but also by improving autonomy, competence, relatedness, and self-perception.

Although teachers participated in professional development to learn how to apply UDL, students perceived the use of UDL strategies as only moderate. This suggests the need for additional or longer-term training so teachers can implement UDL more consistently and effectively in both instruction and assessment.

A surprising result was that UDL implementation was associated with both engagement and disengagement. This may occur because some students misunderstand modern, student-centered instructional strategies. Coming from traditional environments where teachers were more authoritarian and learning followed strict rules, students may misinterpret flexibility as reduced academic expectations. Some may assume that, because multiple assessment options exist, the effort required for learning is lower. Additionally, many dual-education students prioritize practical, hands-on training over theoretical learning, which can lead to reduced motivation for academic content.

From this perspective, teachers should create a supportive and relaxed classroom climate while also maintaining clear boundaries and guidance. Flexibility should be introduced gradually, ensuring that students understand how to use autonomy responsibly. Instructional choices must be carefully negotiated, as some students tend to minimize effort and choose the simplest path to meeting requirements.

Given the importance of dual education in preparing specialists for high-demand technical fields - areas currently facing shortages in Romania - greater investment is needed in teacher

ISSN 2784 – 3092
ISSN – L 2784 - 3092
psychopedagogy.unibuc.ro

training. Supporting teachers in mastering effective UDL practices can improve instructional quality and help students better integrate theoretical and practical learning.

Limitations and Future Research Directions

Although this study required substantial time and effort for participant recruitment and teacher training, several limitations must be acknowledged. First, all questionnaires were administered online and relied on self-report measures. Because of this, students may have under- or overestimated their experiences, providing responses that do not fully reflect reality.

Second, the teachers trained in UDL may not have had sufficient time to fully integrate the information acquired during the training sessions, which could have resulted in only partial or imprecise application of UDL principles in their classrooms. A valuable future research direction would therefore be a follow-up study examining the extent to which teachers continue to apply UDL principles - either more effectively or less effectively - over the following years.

Given the specific aims of dual education, another line of inquiry could involve tracking students longitudinally, following them through completion of their studies and monitoring their transition into the labor market.

Reference

Bandura, A. (1997). *Self-efficacy: The exercise of control*. W.H. Freeman.

Camera de Comerț și Industrie a României, CCIR. (2024). *Învățământul profesional dual, soluție pentru forța de muncă*. Disponibil la https://ccir.ro/invatamantul-profesional-dual-solutie-pentru-forta-de-munca/

CAST. (2018). *Universal Design for Learning Guidelines version 2.2*. Author.

Comisia Europeană. (2023). *Education and Training Monitor 2023*. Available at https://op.europa.eu/webpub/eac/education-and-training-monitor-2023/ro/country-reports/romania.html#4-vocational - education

Consiliul Uniunii Europene. (2023). *Recomandarea Consiliului privind Programul național de reformă al României pentru 2023 și care include un aviz al Consiliului privind Programul de convergență al României pentru 2023*. Available at https://data.consilium.europa.eu/doc/document/ST-9849-2023-REV-1/ro/pdf

Courey, S. J., Tappe, P., Siker, J., & LePage, P. (2013). Improved lesson planning with Universal Design for Learning (UDL). *Teacher Education and Special Education, 36*(1), 7-27.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227-268.

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74*(1), 59-109.

Hall, T. E., Meyer, A., & Rose, D. H. (2012). *Universal Design for Learning in the classroom:Practical applications*. Guilford Press.

Harter, S. (2012). *The construction of the self: Developmental and sociocultural foundations*. Guilford Press.

Harter, S. (2012). *Self-Perception Profile for Adolescents: Manual and Questionnaires*. University of Denver.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*(1), 81-112.

Jenkins-Guarnieri, Michael A., Vaughan, Angela L., & Wright, Stephen L. (2015). Development of a self-determination measure for college students: Validity evidence for the Basic Needs Satisfaction at College Scale. *Measurement and Evaluation in Counseling and Development, 48*(4), 266-284. doi: https://dx.doi.org/10.1177/0748175615578737

Jiménez, T., Graf, V., & Rose, D. H. (2020). Using Universal Design for Learning (UDL) to support diverse learners in the classroom: A case study. *International Journal of Inclusive Education, 24*(7), 775-789.

Katz, I. (2013). Enhancing students' engagement with school by fostering autonomy: A motivational model. *Social and Personality Psychology Compass, 7*(12), 863-877.

Katz, I., & Assor, A. (2007). When choice motivates and when it does not. *Educational Psychology Review, 19*, 429–442.

ISSN 2784 – 3092
ISSN – L 2784 - 3092
psychopedagogy.unibuc.ro

Katz, J., & Porath, M. (2011). Adolescents' perceptions of the quality of their own and their best friends' experiences in school. *Canadian Journal of Education, 34*(1), 51-68.

Katz, J., & Sugden, R. (2013). The Three-Block Model of Universal Design for Learning (UDL): Engaging students in inclusive education. *Canadian Journal of Education, 36*(1), 153–194.

Katz, J. (2013). The Three-Block Model of Universal Design for Learning (UDL): Engaging students in inclusive education. *Canadian Journal of Education, 36*(1), 153-194.

McGhie-Richmond, D., & Sung, A. (2013). Application of the UDL principles to construct inclusive classroom learning experiences for high school students with learning disabilities. *Journal of Research on Technology in Education, 45*(3), 231–248.

Meyer, A., Rose, D. H., & Gordon, D. (2014). *Universal Design for Learning: Theory and practice*. CAST Professional Publishing.

Novak, K., & Rodriguez, K. (2016). *UDL Now!: A Teacher's Guide to Applying Universal Design for Learning in Today's Classrooms*. CAST Professional Publishing.

Rao, K., Ok, M. W., & Bryant, B. R. (2014). A review of research on Universal Design for Learning (UDL) in postsecondary education. *Journal of Postsecondary Education and Disability, 27*(3), 233–249.

Reeve, J., Deci, E. L., & Ryan, R. M. (2004). Self-determination theory: A dialectical framework for understanding sociocultural influences on student motivation. In *Big Theories Revisited* (pp. 31-60).

Rose, D. H., & Dalton, B. (2009). *Universal design for learning in the classroom: Practical applications*. Guilford Press.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology, 25*(1), 54-67.

Salmela-Aro, K., & Upadyaya, K. (2014). Developmental trajectories of school burnout: Evidence from two longitudinal studies. *Learning and Individual Differences, 36*, 60-68.

Schunk, D. H., Pintrich, P. R., & Meece, J. L. (2008). *Motivation and learning*. Pearson Education.

Skinner, E., Kindermann, T., & Furrer, C. (2009). A motivational perspective on engagement and disaffection. *Educational and Psychological Measurement, 69*(3), 493-525.

Skinner, E., Furrer, C., Marchand, G., Kindermann, T. (2008). Engagement and Disaffection in the Classroom: Part of a Larger Motivational Dynamic*?*. *Journal of Educational Psychology, 100*(4), 765-781. doi: 0.1037/a0012840

Stefanou, C. R., Perencevich, K. C., DiCintio, M., & Turner, J. C. (2004). Supporting autonomy in the classroom: Ways teachers encourage student decision making and ownership. *Educational Psychologist, 39*(2), 97-110.

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257-285.

Van Petegem, S., Aelterman, N., Vansteenkiste, M., & Beyers, W. (2008). The relation between autonomy and relatedness: Positive effects and the moderating role of identity in explaining academic engagement and school achievement. *Learning and Individual Differences, 18*(4), 292-299.

Vansteenkiste, M., Lens, W., & Deci, E. L. (2004). Intrinsic versus extrinsic goal contents in self-determination theory. *Educational Psychologist, 39*(2), 89-92.

Zimmerman, B. J., & Cleary, T. J. (2006). Adolescents' development of personal agency. In F. Pajares & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 45-69). Information Age Publishing.

UNESCO. (2012). *Regândirea educației: investiții în competențe pentru rezultate socio-economice mai bune* (COM(2012)669).