REVIEW OF PSYCHOPEDAGOGY
REVISTA DE PSIHOPEDAGOGIE

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

DOI: https://doi.org/10.56663/rop.v13i1.73

# Learning how to learn and universal design for learning. A study about new teaching strategies

**Andreea Gabriela Chivu, PhD(c)[1]; Maia Borozan, PhD[1]**

## Abstract

The aim of the present study is to analyze the relationships between the implementation of UDL (universal design for learning) principles and L2L (learning how to learn) strategies in the teaching process for primary school students, as well as the moderating role of teachers' experience in this relationship. A number of 65 teachers aged between 23 and 65, M = 42.54, SD = 7.89 with different levels of experience participated in the study. The instruments used were the UDL Questionnaire for Teachers and the L2L Questionnaire for Teachers. The results showed that there are significant positive relationships between UDL principles and L2L strategies, and these relationships are strengthened by teachers' level of experience. The practical implications of these results and the possible positive effects of implementing such methods in teaching activities on students were discussed.

**Keywords:** Universal Design for Learning (UDL), Learning to Learn (L2L) strategies, primary education, teaching process, teachers' experience, educational strategies, moderating effects, teaching methods, student outcomes, pedagogical research.

## Introduction

Implementing learning how to learn (L2L) strategies in primary school has gained widespread recognition as an essential component of modern education. These strategies encompass metacognitive techniques that help students understand and manage their own cognitive processes, such as setting learning goals, self-monitoring, and reflecting on their learning. Research has shown that early exposure to L2L strategies fosters self-regulation, independence, and adaptability, which are crucial skills for lifelong learning (Zimmerman, 2002). The benefits of teaching young students how to learn extend beyond academic success, supporting their social-emotional development and building resilience.

## Learning how to learn in primary school

Learning how to learn is a metacognitive process that involves understanding one's own thinking and being able to apply strategies to optimize learning (Flavell, 1979). Key L2L strategies include goal setting, planning, self-assessment, and reflection. Teaching these strategies to primary school students enables them to gain awareness of their strengths, challenges, and preferred methods of learning, helping them become active participants in their educational journeys (Paris & Winograd, 1990).

In the primary years, children begin to develop cognitive skills and are highly receptive to learning new strategies. Introducing L2L at this stage is crucial because it helps students build positive

[1] Ion Creangă State Pedagogical University of Chișinău, Republic of Moldova
Corresponding Author:
Email: achivu@ymail.com

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

learning habits early, creating a strong foundation for future academic achievement. Studies have shown that metacognitive instruction at a young age can improve student confidence, engagement, and motivation (Dignath & Büttner, 2008). When students are equipped with metacognitive tools, they can approach learning tasks more effectively, evaluate their progress, and make adjustments as needed, all of which contribute to a growth-oriented mindset.

The implementation of L2L strategies in primary school has been shown to positively impact academic performance across subjects. For instance, a study by Veenman et al. (2006) found that students who regularly engaged in metacognitive activities such as self-questioning, monitoring, and evaluating their work showed significantly higher levels of academic achievement than those who did not. L2L strategies help students break down complex tasks into manageable steps, improving their ability to solve problems and retain information.

In a study examining the relationship between self-regulation and academic achievement in primary school students, Stoeger and Ziegler (2008) found that students who learned self-regulatory strategies such as goal setting and reflection performed better academically than those who did not receive this instruction. Furthermore, these students showed a higher level of engagement and persistence, even when faced with challenging tasks. Early exposure to self-regulation skills helps students become more resilient, giving them the tools to overcome setbacks and adapt to different learning environments.

Another important benefit of implementing L2L strategies in primary school is the promotion of a growth mindset. A growth mindset is the belief that intelligence and abilities can be developed through effort and perseverance (Dweck, 2006). By learning how to set goals, monitor progress, and reflect on their learning, students begin to see challenges as opportunities for growth rather than as obstacles. This mindset is crucial for building resilience, which is essential for coping with academic, social, and emotional challenges.

Research by Dweck (2006) highlights the importance of fostering a growth mindset in young learners, as students with this mindset are more likely to embrace challenges, persist through difficulties, and recover from setbacks. Implementing L2L strategies helps students understand that effort and persistence are central to improvement and encourages them to take ownership of their learning journey. By fostering a growth-oriented attitude, primary school educators can help students become more resilient and better equipped to handle both academic and personal challenges.

In practice, teaching L2L strategies in primary school can take various forms. For example, teachers might use think-aloud exercises to model metacognitive strategies, encouraging students to verbalize their thought processes as they solve problems or read texts (Ritchhart et al., 2011). Reflection journals, goal-setting exercises, and self-assessment checklists are other effective methods for promoting L2L in young students. Moreover, by incorporating L2L strategies into daily routines and subject-specific lessons, teachers can help students internalize these skills and make them an integral part of the learning process. For instance, a teacher might guide students to set specific goals at the beginning of a math unit, then have them reflect on their progress at the end of each week. These practices not only improve students' metacognitive abilities but also make learning more engaging and personalized.

Implementing learning how to learn strategies in primary school is essential for developing independent, self-regulated learners who are equipped for lifelong success. Research shows that these strategies improve academic performance, foster resilience, and support a growth mindset, all of which are critical for navigating the demands of a complex world. By teaching primary

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

school students to understand and manage their own learning processes, educators can provide a strong foundation that supports not only academic achievement but also personal growth and adaptability.

**Implementing learning how to learn strategies in classroom**

Learning to learn is a dynamic process that involves cognitive, metacognitive, motivational, emotional, and behavioral actions aimed at acquiring theoretical and practical knowledge. The strategies used for learning to learn include thoughts, beliefs, emotions, or behaviors that facilitate the acquisition, understanding, application, and transfer of new knowledge and skills to various life contexts. Learning to learn strategies help give meaning to newly acquired information and store it in long-term memory, so that it can be integrated with already known information and easily retrieved when needed, especially in transfer contexts (Weinstein et al., 2011).

Weinstein and Mayer (1986) reviewed specific learning how to learn strategies and created a taxonomy comprising six categories of learning strategies: 1. Rehearsal strategies for basic learning tasks. This is a strategy used for simple memorization tasks and involves repeating the material to be memorized. 2. Rehearsal strategies for complex learning tasks. This strategy involves engaging more complex knowledge and skills beyond simple memorization. It includes highlighting certain paragraphs in a text, color-coding notes, and rewriting the main ideas of a lesson. This strategy is suitable when building a knowledge base in a particular area is desired. 3. Elaboration strategies for basic learning tasks. This involves building bridges between new information and already known information. It helps students assign relevance and meaning to information. Examples include generating a mental image of a scene described in a literary text or associating a scientific principle with real-life situations. 4. Elaboration strategies for complex learning tasks. These help students be more active in building connections between information or experiences. They may involve paraphrasing and summarizing, applying a known strategy to solve a new problem, creating analogies, or using concrete experiences to explain or understand new concepts. 5. Organization strategies for basic learning tasks. These involve transforming information into another form and producing a schema that gives structure to this new way of characterizing information. 6. Organization strategies for complex learning tasks. These aim to increase the meaningfulness of information and may include creating hierarchies of main ideas in a text, generating diagrams or tables to highlight key ideas in learning material.

All of these strategies contribute to learning not only through final results (e.g., creating a diagram) but also through the process of elaboration itself, as it aids in knowledge acquisition, later recall, and performance.

Model of strategic learning. With a deeper understanding of how students learn and the context of learning, learning models have evolved over time, as have teaching techniques and the preparation of learning content. Weinstein et al. (2000, 2011) and Weinstein and Acee (2013) developed a model focusing on variables that can influence strategic learning. This model emphasizes the student's long-term goals and self-system variables. Within the model, the importance of goals set by the student is highlighted, as these provide direction for self-regulating thoughts and actions, as well as for generating and maintaining the motivation needed to implement them. Goals represent learning tasks that must be successfully completed and are part of much more complex future objectives, which give them increased importance through their utility.

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

**The links between learning how to learn (L2L) and universal design for learning (UDL)**

The concept of learning how to learn emphasizes metacognitive strategies that enable students to understand and manage their own learning processes. It's increasingly recognized as essential in preparing students for lifelong learning and adaptability in a rapidly changing world (Ritchhart et al., 2011). In primary education, introducing students to metacognitive strategies - such as goal setting, self-monitoring, and reflection - can foster a stronger sense of ownership over their learning and improve their overall academic performance (Zimmerman, 2002). Universal Design for Learning (UDL), on the other hand, is an educational framework designed to accommodate a diverse range of learners by providing multiple means of engagement, representation, and expression (CAST, 2018). Integrating L2L strategies within a UDL framework can create a supportive, flexible environment that empowers all students to thrive, regardless of their individual abilities or backgrounds.

UDL is an approach to education that focuses on providing multiple means of representation, expression, and engagement to ensure that all students have equal opportunities to learn (Meyer et al., 2014). UDL suggests that by proactively designing educational materials and activities to meet diverse learning needs, educators can minimize the need for individual accommodation and promote inclusivity. The principles of UDL are:

1. Multiple means of representation; this principle addresses the "what" of learning by providing options for how information is presented, in a UDL-based classroom, teachers might use visual aids, audio recordings, and interactive activities to explain new content, allowing students to access information in the way that best suits their learning style (Meyer et al., 2014).
2. Multiple means of action and expression: The "how" of learning focuses on providing various ways for students to demonstrate their understanding. By allowing students to use different methods (e.g., writing, drawing, oral presentations), UDL encourages students to express their knowledge in ways that align with their strengths (CAST, 2018).
3. Multiple means of engagement: This principle addresses the "why" of learning by offering choices in activities, fostering interest, and encouraging student motivation. In primary education, offering choices - such as different types of reading materials or activity formats - can help maintain young learners' enthusiasm for learning (CAST, 2018).

**Integrating learning how to learn strategies and UDL in primary education**

UDL and learning how to learn strategies can be mutually reinforced. For example, teaching students metacognitive strategies aligns with the UDL principle of engagement. When students understand how they learn best, they are more likely to be motivated and engaged in the classroom (Rose et al., 2005). Providing diverse methods of instruction and representation also supports metacognitive development by encouraging students to explore different ways of processing information.

Furthermore, UDL's emphasis on multiple means of action and expression allows students to practice self-regulated learning strategies. For instance, if students are given choices in how they complete assignments, they can practice goal-setting and time management. Allowing students to reflect on the effectiveness of different strategies fosters self-awareness and adaptability, which are key components of learning how to learn.

In practice, integrating UDL and learning how to learn strategies might involve classroom activities that encourage students to evaluate their performance and reflect on their strategies. Teachers might also model metacognitive strategies during lessons by thinking aloud, showing

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

students how to set learning goals, monitor their progress, and make adjustments as needed (Schunk & Zimmerman, 2007). These practices help create a classroom culture where students are active participants in their own learning and are equipped with strategies that they can apply independently.

The integration of learning how to learn strategies and UDL in primary education provides a holistic approach to student development. Both frameworks emphasize empowering students to take ownership of their learning processes, encouraging adaptability, resilience, and independence. By combining the flexibility of UDL with metacognitive training, educators can create inclusive and supportive learning environments that prepare all students for future academic and personal success.

**The role of teacher experience**

Teacher experience plays a significant role in the adoption and effectiveness of instructional strategies, particularly when it comes to metacognitive or learning how to learn strategies and the Universal Design for Learning (UDL) framework. Research suggests that experienced teachers tend to implement these frameworks with greater confidence and adaptability than their less experienced counterparts, often because they possess a deeper understanding of diverse learner needs, classroom management, and instructional adaptation (Darling-Hammond, 2006). This scientific overview examines the statistical differences according to teacher experience in primary education concerning learning how to learn strategies and UDL implementation.

Research shows that more experienced teachers are often more adept at incorporating L2L strategies into their teaching. These strategies require not only the knowledge of metacognitive processes but also the skill to seamlessly integrate them into daily routines and subject-specific content (Paris & Winograd, 1990). Studies have identified statistical differences in the application of these strategies across different levels of experience. Experienced teachers, for example, are often more comfortable with teaching techniques such as self-monitoring, goal-setting, and reflective practices. According to Ritchhart et al. (2011), experienced teachers demonstrate greater effectiveness in fostering a metacognitive environment by modeling strategies and encouraging independent reflection, likely due to their greater familiarity with differentiated instruction and classroom dynamics.

A survey conducted by Smith et al. (2018) found that primary school teachers with more than 10 years of experience were significantly more likely to use and emphasize L2L strategies compared to their less experienced peers. The study revealed that while 85% of veteran teachers reported using goal-setting and self-monitoring techniques regularly, only about 60% of teachers with fewer than five years of experience reported similar practices. This suggests that experience allows teachers to feel more confident and capable of teaching these strategies, particularly within the diverse and often unpredictable environment of primary education.

UDL emphasizes flexibility in teaching, requiring teachers to provide multiple means of engagement, representation, and expression (Meyer et al., 2014). Experienced teachers are statistically more likely to implement UDL principles consistently, largely due to their accumulated knowledge and comfort with a wide range of instructional strategies and student accommodations (McLeskey & Waldron, 2002). Younger or less experienced teachers, on the other hand, may struggle with the complexities of applying UDL, especially as they are simultaneously learning core classroom management skills and curriculum standards.

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

In a study by Rao et al. (2017), teachers with five or few years of experience reported that while they understood the value of UDL, they found it challenging to apply its principles regularly. Specifically, they reported difficulty with providing multiple means of expression, often defaulting to more traditional forms of assessment. In contrast, teachers with more than 15 years of experience were significantly more likely to incorporate UDL principles consistently across their lessons, with 72% reporting regular use of varied instructional techniques compared to only 45% among less experienced teachers.

Moreover, experienced teachers are often more adept at anticipating potential barriers to learning and proactively designing materials that address these challenges. They tend to possess a richer toolkit of alternative methods and resources, which allows them to implement UDL more effectively. This adaptability has been attributed to their accumulated classroom experience, which helps them navigate the unique challenges associated with supporting diverse learners (Darling-Hammond et al., 2017).

Integrating L2L and UDL requires a high degree of pedagogical adaptability, which experienced teachers are statistically more likely to possess. In an analysis of teacher survey data, McHatton and Parker (2013) found that teachers with extensive experience were not only more likely to use metacognitive strategies but also to implement them within a UDL framework, allowing students multiple ways to engage, process, and demonstrate learning. For example, a veteran teacher might incorporate reflective activities as a part of project-based learning, allowing students to set goals, monitor their progress, and assess their understanding through varied modes of expression.

The combined use of UDL and L2L strategies can improve learning outcomes by catering to students' individual needs and fostering a self-directed approach to learning. Teachers with higher experience levels were more confident in using these frameworks together, suggesting that experience facilitates the integration of metacognitive and differentiated instructional strategies in ways that support all learners. In contrast, novice teachers were often more focused on mastering basic classroom management and instructional practices, which limited their ability to implement these advanced strategies effectively.

**The present study**

The present study aims to establish the relationships between the implementation of L2L strategies and UDL principles in the process of teaching primary school students, and also the role of the teachers' level of experience in this relationship. Starting from the theoretical aspects mentioned above, we aim to verify whether the level of experience of primary school teachers moderates the relationship between the implementation of L2L strategies and the application of UDL principles.

To establish L2L strategies we used a model suggested by Oakley (2019) and Oakley et al. (2022), which includes four strategies. Barbara Oakley is an expert in learning and neuroscience and has developed a framework for effective learning strategies, which she outlines in her popular courses and book, ”A Mind for Numbers: How to Excel at Math and Science (Even if You Flunked Algebra)”. Oakley’s approach is based on cognitive science research and her experience teaching complex subjects. Her five main learning strategies – switching attention between focused mode and diffuse mode, chunking, summarizing, recalling and testing - help students improve their understanding and retention of information. These strategies are particularly beneficial in fields requiring problem-solving and conceptual integration, such as mathematics and science (Oakley, 2014).

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

**1. Focused mode and diffuse mode**

Focused mode involves concentrating intently on a particular task or problem, blocking out distractions to allow for deep, sustained thought. This mode of thinking is associated with the brain's prefrontal cortex, which is responsible for directing attention and processing immediate tasks (Oakley, 2014). When in focused mode, learners zero in on a specific concept or skill, actively working through it with full attention. Oakley emphasizes that focused mode is critical for tasks that require detailed problem-solving, such as performing calculations in math or decoding complex scientific formulas. Research has demonstrated that focused, uninterrupted attention is key for successful learning. Studies in cognitive psychology have shown that focus enhances memory retention and facilitates deep processing of information (Ericsson et al., 1993). By intentionally setting aside periods for focused work, learners can better commit complex information to memory and perform challenging tasks more efficiently.

Diffuse mode is a relaxed state of thinking that allows the mind to wander and make broader connections, activating various regions of the brain. While the focused mode is necessary for detail-oriented work, the diffuse mode is essential for creative problem-solving and big-picture thinking. Oakley describes this mode as the mental state we enter when we are daydreaming, walking, or engaging in a relaxed, non-demanding activity. In the diffuse mode, the brain creates associations and forms links between concepts, leading to insights that might not occur during intense focus (Oakley, 2014). Research supports the importance of alternating between focused and diffuse modes for optimal learning. Studies on creativity and problem-solving reveal that insights and innovative ideas often emerge during relaxed, unfocused states (Beaty et al., 2016). Allowing time for the mind to operate in this mode can lead to “aha” moments, where complex problems suddenly become clear. Oakley encourages students to take breaks and engage in relaxed activities to enable diffuse thinking, which helps consolidate and integrate new information.

**2. Chunking**

Chunking is the process of grouping related pieces of information into meaningful clusters or "chunks" to enhance memory and understanding. This strategy helps learners break down complex information into smaller, more manageable units, making it easier to remember and retrieve. For example, when learning a new mathematical formula, students might learn each component individually before practicing how the elements interact as a whole. By organizing information into chunks, learners can build a scaffold for more advanced knowledge, strengthening their foundational understanding (Oakley, 2014).

The effectiveness of chunking is well-supported in cognitive psychology. Research by Miller (1956) identified that working memory can hold only about seven items at a time, but chunking allows individuals to handle more information by grouping related elements together. Other studies indicate that chunking promotes long-term memory formation, especially in areas such as language learning and mathematics (Gobet et al., 2001). Oakley suggests that students can improve their learning outcomes by identifying and practicing chunks, eventually combining them to tackle larger problems with ease.

**3. Summarizing**

Summarizing involves distilling information into a concise form that highlights the main ideas and essential points. This strategy encourages students to rephrase content in their own words, which deepens their understanding by engaging in both their cognitive and metacognitive skills. When summarizing, learners actively identify key elements of the material, which allows them to process information more deeply than they would through simple reading or note-taking. According to

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

Oakley, summarizing helps break down complex information and solidifies knowledge by allowing the learner to reconstruct the information into a structured format that is easier to remember (Oakley, 2014). Research in cognitive psychology supports summarizing as a highly effective learning strategy. Studies have shown that summarizing promotes better comprehension by requiring the learner to focus on the meaning and relevance of information, rather than just memorizing details (Pressley et al., 1987). In addition, creating summaries improves retention by allowing students to condense and personalize material, which enhances encoding in long-term memory. The act of summarizing not only aids in initial learning but also provides a useful resource for future review and reinforcement.

Oakley emphasizes the power of metaphors and analogies to make abstract concepts more understandable by linking them to familiar ideas. Metaphors and analogies help students relate new information to known concepts, facilitating comprehension and retention. For instance, comparing an electrical circuit to water flowing through pipes can make it easier for students to grasp the concept of current and resistance. This approach leverages learners' existing knowledge to build bridges to new, unfamiliar material (Oakley, 2014). Studies in education and cognitive science confirm the value of using metaphors and analogies in teaching. Research shows that analogical reasoning aids in knowledge transfer, allowing students to apply learned concepts to different contexts (Gentner & Holyoak, 1997). Analogies not only clarify complex ideas but also help in organizing information, as they often provide a mental model that students can use to structure their understanding. Oakley advises students to develop their own metaphors and analogies when learning difficult concepts, as this personal engagement with the material fosters deeper comprehension.

**4. Recalling**

Recalling is the practice of actively retrieving information from memory without referring to notes or other resources. Oakley underscores the importance of this strategy as it directly strengthens neural pathways associated with knowledge, making future recall easier and more accurate. The process of recalling information reinforces connections in the brain and facilitates deeper understanding of the material. By engaging in recall, learners move information from passive recognition to active knowledge, which is more likely to be retained over the long term (Oakley, 2014). Research demonstrates that active recall is more effective than passive review. For example, the testing effect—the finding that practice testing significantly enhances learning and retention—shows that retrieval practice is one of the most effective methods for solidifying learning (Roediger & Butler, 2011). According to studies, when learners repeatedly retrieve information, they engage in a process that strengthens memory and improves the ability to apply knowledge to new contexts. Oakley recommends integrating recall exercises into study sessions, such as attempting to recite concepts from memory or sketching out key ideas before reviewing notes, to make learning more durable.

**5. Verification**

Testing or verification is the practice of regularly assessing one’s knowledge and understanding of material to identify gaps and misunderstandings. Oakley advocates for frequent self-testing as a means to monitor progress and correct errors, which ultimately builds confidence and reduces exam anxiety. Through self-testing, learners actively engage with the material and verify their knowledge against correct answers or reliable sources, which improves accuracy and boosts retention. Oakley points out that self-testing encourages a growth mindset, as students can see their progress and focus on areas needing improvement (Oakley, 2014). Empirical evidence supports

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

the effectiveness of testing and verification as a learning strategy. Studies show that frequent self-testing promotes metacognitive awareness, allowing students to gauge their knowledge accurately and target their weaknesses (Karpicke & Blunt, 2011). Testing also improves retention by reinforcing neural connections through active retrieval, as mentioned in the testing effect research. Additionally, regular self-testing enhances transfer, helping students apply their knowledge in different contexts and improving problem-solving skills.

This L2L model may provide an effective framework for understanding and mastering complex information. These strategies are rooted in cognitive science and supported by research in psychology and education, offering practical methods for improving learning outcomes. By alternating between focused and diffuse thinking, organizing information into chunks, summarizing, recalling, and verification, students can enhance their cognitive abilities and achieve greater success in challenging subjects. These strategies, supported by empirical research, are essential tools for developing effective learning habits and improving long-term academic success.

Regarding UDL, we have established four principles, respectively: using technology, differentiated teaching, cooperative teaching, and individualized assessment.

Considering all this, we formulate the hypothesis of the present study:

H1. *Teachers' level of experience moderates the relationship between the implementation of L2L strategies and the application of UDL principles in primary classrooms.*

## Method

### Participants and procedure

In this study participated 65 primary school teachers, exclusively women, aged between 23 and 62, M = 42.54, SD = 7.89. Of these, four have experience of less than one year (6%), seven have experience between 1 and 4 years (11%), seven have experience between 5 and 10 years (11%), 12 have a experience between 10 and 15 years (18%), and 35 have more than 15 years experience (54%). Regarding the didactic degree, nine are beginners (14%), eight are titulars (12%), 19 have the 2nd degree (29%), and 29 have the 1st degree (45%).

The teachers participated in a training course to improve teaching techniques according to L2L principles in December 2023, and between January and June 2024 they implemented these principles in the primary classes they teach, during three school modules. Teachers were invited to participate in this study in July 2024, in a meeting organized with the aim of sharing impressions about the experiences they had in the teaching activities of the last school year. They were given a description of the study, then those who agreed to participate signed the informed consent form, the study participation agreement and GDPR agreement.

Testing took place online via google form and took about 20 minutes. Out of a total of 90 teachers invited to participate, only 65 completed the questionnaires (72%). Data were organized and analyzed with the statistical analysis program Jamovi (the Jamovi project, 2022).

The study has a crossectional exploratory design.

### Instruments

*Sociodemographic data* were collected using a set of questions regarding age, gender, experience and teaching degree.

*The implementation of L2L strategies* was measured with the L2L Questionnaire for Teachers, developed by us for the purpose of this study. The instrument includes 25 items, five for each of

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

the five L2L principles (switching attention between focused and diffuse mode, chunking, summarizing, recalling, and verification). Answers are given on a five-point Likert scale, where 1 – to a very small extent and 5 – to a very large extent. Example items: "I take breaks for a few minutes so that students can shift their attention from focused to diffuse mode", "After teaching a part of the content to be learned, I invite students to extract the main ideas". Scores can range from 5 to 25 for each strategy and from 25 to 125 for the overall calculation, with high scores indicating a high level of implementation of the specific strategy.

*The implementation of UDL principles* was measured with the UDL Questionnaire for Teachers (Piticari, 2023). The instrument includes 16 items, four for each of the following dimensions: use of technology, differentiated teaching, cooperative teaching, individualized assessment. Scoring is done on a five-point Likert scale, where 1 – not at all and 5 – always. Sample items: "I use interactive technology to facilitate student participation and communication," "I create as many opportunities as possible for students in the class to work in pairs." Scores can range from 4 to 20 for each dimension and from 16 to 80 on the global score, with higher scores indicating an increased level of implementation of UDL principles.

**Descriptive statistics**

Means, standard deviations, Cronbach Alpha coefficients, skewness and kurtosis are presented in Table 1.

**Table 1**

*Means, standard deviations, Cronbach Alpha coefficients, skewness and kurtosis*

| | M | SD | α | Skewness | Kurtosis |
|---|---|---|---|---|---|
| PMCD | 18.43 | 2.91 | .69 | -.42 | .08 |
| PDCI | 23.22 | 1.93 | .68 | -1.01 | .30 |
| PSUM | 20.46 | 3.62 | .70 | -.71 | .45 |
| PREC | 21.35 | 2.53 | .75 | -.55 | .01 |
| PVER | 22.00 | 2.82 | .68 | -1.10 | 1.04 |
| UFT | 14.95 | 3.86 | .81 | -.84 | .16 |
| UPD | 18.60 | 1.81 | .77 | -1.40 | 1.25 |
| UPC | 16.72 | 2.64 | .80 | -.68 | .14 |
| UEI | 17.91 | 2.07 | .80 | -.65 | -.74 |
| L2L | 105.46 | 10.35 | .70 | -.56 | .15 |
| UDL | 68.18 | 8.01 | .79 | -.54 | -.47 |

*Note: PMCD – principle of switching attention between focused to diffuse mode, PDCI – principle of chunking, PSUM – principle of summarization, PREC – priciple of recalling, PVER – principle of verification, UFT – using technology, UPD – differentiated teaching, UPC – cooperative teaching, UEI – individualized assessment, L2L – learning how to learn strategies, UDL – universal design for learning principles*

The results show that teachers reported high scores for all specific L2L strategies, the highest being reported for chunking, M = 23.22, SD = 1.93, followed by verification, M = 22.00, SD = 2.82, then recalling, M = 21.35, SD =2.53, summarizing, M = 20.46, SD = 3.62 and finally switching attention between focused and diffuse mode, M = 18.43, SD = 2.91. Regarding the implementation of UDL principles, the teachers reported relatively low scores, the highest being reported for differentiated teaching, M = 18.60, SD = 1.81, followed by individualized assessment, M = 17.91, SD = 2.07, then cooperative teaching, M = 16.72, SD = 2.64 and finally for using technology, M = 14.95, SD = 3.86.

Skewness and kurtosis are in the range (01.40, 1.25), reflecting a normal data distribution.

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

The correlations among variables are presented in Table 2 and the correlations between the global constructs of L2L and UDL are presented in Table 3.

**Table 2**

*Correlations among L2L strategies and UDL principles*

| | PMCD | PDCI | PSUM | PREC | PVER | UFT | UPD | UPC | UEI |
|---|---|---|---|---|---|---|---|---|---|
| PMCD | 1 | | | | | | | | |
| PDCI | .20* | 1 | | | | | | | |
| PSUM | .26* | .51** | 1 | | | | | | |
| PREC | .28* | .46** | .59** | 1 | | | | | |
| PVER | .27* | .63** | .67** | .56** | 1 | | | | |
| UFT | .28* | .33** | .33** | .23 | .36** | 1 | | | |
| UPD | .14 | .58** | .35** | .40** | .45** | .41** | 1 | | |
| UPC | .25* | .40** | .56** | .58** | .48** | .41** | .51** | 1 | |
| UEI | .14 | .41** | .53** | .40** | .61** | .31* | .57** | .62** | 1 |

*Note: **. $p < .01$, *. $p < .05$.*

*PMCD – principle of switching attention between focused to diffuse mode, PDCI – principle of chunking, PSUM – principle of summarization, PREC – priciple of recalling, PVER – principle of verification, UFT – using technology, UPD – differentiated teaching, UPC – cooperative teaching, UEI – individualized assessment*

**Table 3**

*Correlations between L2L and UDL*

| | L2L | UDL |
|---|---|---|
| L2L | 1 | |
| UDL | .65** | 1 |

*Note: **. $p < .01$*

*L2L - Learning how to learn strategies, UDL - Universal design for learning principles*

It can be seen that there are significant positive correlations between L2L strategies and UDL principles, both for each individual variable and for the global level.

## Hypothesis testing

H1. *Teachers' level of experience moderates the relationship between the implementation of L2L strategies and the application of UDL principles in primary classrooms.*

To test this hypothesis, a moderation analysis was performed with UDL as the predictor, L2L as the dependent variable and teachers' level of experience as the moderating variable.

**Table 4**

*Moderation estimates for teacher experience in the relationship between UDL and L2L*

| | | | 95% CI | | | |
|---|---|---|---|---|---|---|
| | **Estimate** | **SE** | **Lower** | **Upper** | **Z** | **p** |
| UDL | .89 | .12 | .66 | 1.13 | 7.43 | < .001 |
| Experience | .32 | .73 | -1.11 | 1.75 | .44 | .66 |
| UDL ✻ Experience | .19 | .08 | .03 | .34 | 2.31 | .02 |

*Note: UDL - Universal design for learning principles*

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

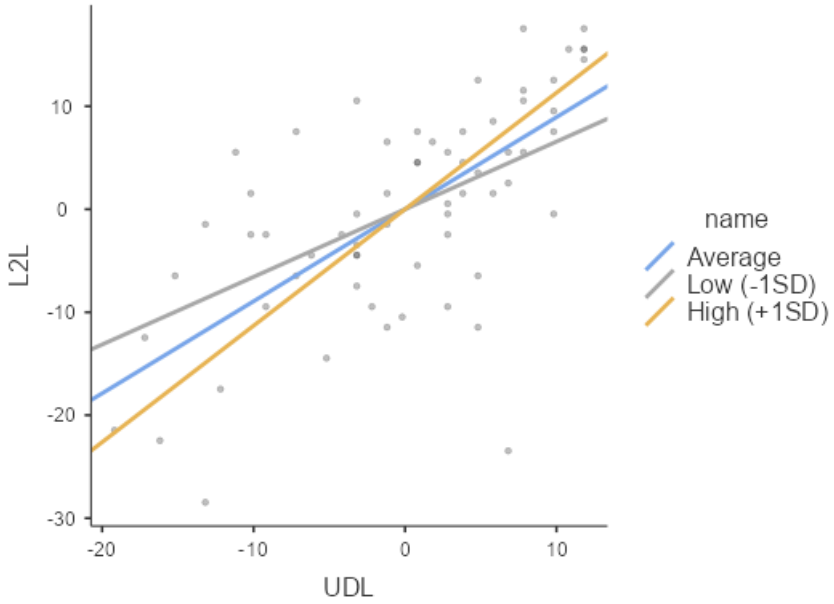
**Table 5**

*The relationship between UDL and L2L for different values of teacher experience*

| | | | 95% CI | | | |
|---|---|---|---|---|---|---|
| | **Estimate** | **SE** | **Lower** | **Upper** | **Z** | **p** |
| Average | .89 | .12 | .65 | 1.14 | 7.22 | < .001 |
| Low (-1SD) | .66 | .14 | .38 | .94 | 4.58 | < .001 |
| High (+1SD) | 1.13 | .18 | .78 | 1.48 | 6.31 | < .001 |

**Figure 1**

*Graphical representation of moderation analysis*




The results show that teachers' experience moderates the relationship between the implementation of UDL principles and L2L strategies, b = .19, CI95%(.03, .34), Z = 2.31, p < .05. The positive relationship between the implementation of UDL principles and L2L strategies becomes stronger as teachers' level of experience increases. Thus, at low levels of experience, b = .66, CI95%(.38, .94), Z = 4.58, p < .01, at average levels of experience, b = .89, CI95%(.65, 1.14 ), Z = 7.22, p < .01, and at high levels of experience, b = 1.13, CI95%(.78, 1.48), Z = 6.31, p < .01.
Considering this result, we can state that hypothesis H1 is supported by the analyzed data.

**Discussions and conclusions**

The present study aimed to analyze the relationship between the implementation of L2L strategies and UDL principles in primary classrooms, as well as the moderating role of teachers' experience. The results showed that there are strong positive associations between the two constructs, which can be attributed to the fact that teachers use elements from both models in their teaching activities, putting them together so that students benefit from the most suitable teaching methods .The

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

relationship between implementing L2L strategies and UDL principles in primary school is a growing area of interest in educational research. Both frameworks focus on empowering students by promoting metacognitive skills and flexible learning approaches, ultimately creating a more inclusive, student-centered environment. Studies in this field suggest that combining L2L strategies with UDL principles not only enhances student engagement but also improves academic outcomes by catering to diverse learning needs.

Learning how to learn involves teaching students to understand and manage their own cognitive processes through metacognitive strategies like goal-setting, self-monitoring, and reflective thinking (Zimmerman, 2002). One of the most widely referenced studies on L2L strategies in primary school is by Paris and Winograd (1990), who examined the effects of teaching metacognitive strategies on student engagement and performance. Their study found that young students who learned to set personal learning goals and regularly self-assess were more engaged and confident, leading to higher academic achievement across subjects. This study emphasized that even young students can benefit from L2L strategies, suggesting that introducing metacognitive skills early in their education provides a foundation for lifelong learning.

In another study, Ritchhart et al. (2011) explored how L2L strategies can foster thinking routines in primary classrooms. They found that by teaching students routines for analyzing, questioning, and summarizing information, teachers could encourage deeper understanding and critical thinking. Their findings suggested that these routines help students develop independent learning skills and make them more adaptable in diverse learning contexts. This study highlights the importance of making metacognition an integral part of classroom activities, especially in primary education.

UDL is a framework that aims to support diverse learners by providing multiple means of engagement, representation, and expression (CAST, 2018). It advocates for designing lessons that are accessible and flexible from the outset, allowing all students to access learning materials in ways that suit their strengths and preferences. Research by Meyer et al. (2014) demonstrated that UDL improves student engagement by allowing teachers to use various instructional methods and materials. For instance, using visual aids alongside verbal instruction or offering both oral and written response options can accommodate different learning preferences and abilities. Their work suggested that when lessons are designed to be inclusive from the start, teachers can minimize the need for individual accommodation.

In a study on UDL implementation in elementary education, Coyne et al. (2012) found that providing students with multiple means of representation (e.g., audio, video, and text-based materials) improved comprehension and retention of information, particularly among students with learning disabilities. This study demonstrated that UDL's principles not only support students with specific needs but also benefit the whole classroom by accommodating various learning styles and preferences.

Several studies have focused specifically on the combined use of L2L strategies within a UDL framework, finding that these approaches together can create an environment conducive to inclusive and effective learning. Smith et al. (2018) conducted a study on the impact of combining L2L and UDL strategies in primary classrooms. Teachers in this study taught students goal-setting techniques and encouraged them to reflect on their progress using self-assessment tools. When these L2L strategies were embedded within a UDL-based curriculum, where students had options for how they engaged and demonstrated learning, students showed significant improvements in both engagement and academic performance. This study supports the idea that L2L strategies,

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

when integrated within a UDL framework, enable students to take control of their learning while benefiting from flexible instructional options.

Basham et al. (2010) examined how integrating L2L strategies within a UDL framework affected students with and without disabilities. They observed that students were more likely to develop self-regulation skills and adopt a growth mindset when given varied opportunities to learn and demonstrate knowledge. For instance, students in the study used goal-setting to plan and track their progress in math and language arts, and had options such as visual, auditory, or kinesthetic activities to engage with the material. The researchers found that by giving students control over how they engaged with content and encouraging self-reflection, teachers could help students become more adaptable and resilient learners.

Okolo and Diedrich (2014) conducted a mixed-methods study on the effects of combining metacognitive (L2L) strategies with UDL practices in early education settings. Their study observed that teachers who used UDL principles to present content in multiple formats (visual, auditory, and tactile) and encouraged students to set goals, monitor their progress, and reflect on their learning saw increased engagement and independence in students. The study also found that students who practiced these metacognitive strategies within a UDL framework were better at adjusting their learning strategies when they encountered challenges. This study underscores the adaptability that L2L and UDL bring to primary classrooms, preparing students to take charge of their learning processes and adapt to diverse educational settings.

The integration of L2L and UDL can be particularly powerful in primary education, where students are developing foundational learning skills and attitudes. These studies suggest that teaching students to reflect on their learning strategies within a UDL-based curriculum helps them become more self-directed, resilient, and engaged. For example, allowing students to choose how they demonstrate their understanding of a topic—whether through a written assignment, a drawing, or a spoken presentation—not only aligns with UDL principles but also encourages students to consider how they learn best and to take ownership of their learning process (CAST, 2018).

At the same time, statistical data reveals clear differences in the implementation of learning how to learn strategies and the Universal Design for Learning framework according to teacher experience. Experienced teachers are significantly more likely to implement both frameworks successfully, largely due to their familiarity with differentiated instruction and accumulated classroom experience. Supporting novice teachers in adopting these strategies through mentorship and targeted professional development could bridge this experience gap and empower all teachers to foster inclusive, metacognitive, and adaptable learning environments.

In conclusion, research supports that combining L2L strategies with UDL can create a more inclusive and engaging learning environment in primary schools. As demonstrated in the studies discussed, this approach not only accommodates diverse learning styles but also teaches young learners' valuable skills for self-regulation, reflection, and adaptability. By empowering students to understand and take charge of their learning, this integrated approach lays a strong foundation for academic success and lifelong learning.

In conclusion, we would like to draw attention to the importance of teachers' experience in implementing new teaching strategies and techniques, emphasizing that young teachers must acquire modern teaching skills, possibly by participating in specific training courses, so that they contribute as much as possible to quality teaching and to support student learning from the first years of school.

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

## Reference

Basham, J. D., Meyer, H., & Perry, E. (2010). The effects of Universal Design for Learning on secondary STEM education. Journal of Special Education Technology, 25(3), 44-57.

Beaty, R. E., Benedek, M., Silvia, P. J., & Schacter, D. L. (2016). Creative cognition and brain network dynamics. Trends in Cognitive Sciences, 20(2), 87-95.

CAST. (2018). Universal Design for Learning Guidelines version 2.2. Retrieved from http://udlguidelines.cast.org

Coyne, P., Pisha, B., Dalton, B., Zeph, L. A., & Smith, N. C. (2012). Literacy by design: A UDL approach for students with significant intellectual disabilities. Remedial and Special Education, 33(3), 162-172.

Darling-Hammond, L. (2006). Powerful Teacher Education: Lessons from Exemplary Programs. Jossey-Bass.

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2017). Implications for educational practice of the science of learning and development. Applied Developmental Science, 21(2), 97-140.

Dignath, C., & Büttner, G. (2008). Components of fostering self-regulated learning among students: A meta-analysis on intervention studies at primary and secondary school level. Metacognition and Learning, 3(3), 231-264.

Dweck, C. S. (2006). Mindset: The New Psychology of Success. Random House.

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive–developmental inquiry. American Psychologist, 34(10), 906-911.

Gentner, D., & Holyoak, K. J. (1997). Reasoning and learning by analogy: Introduction. American Psychologist, 52(1), 32-34.

Gobet, F., Lane, P. C., Croker, S., Cheng, P. C., Jones, G., Oliver, I., & Pine, J. M. (2001). Chunking mechanisms in human learning. Trends in Cognitive Sciences, 5(6), 236-243.

Karpicke, J. D., & Blunt, J. R. (2011). Retrieval practice produces more learning than elaborative studying with concept mapping. Science, 331(6018), 772-775.

McHatton, P. A., & Parker, A. (2013). Purposeful preparation: Longitudinally exploring inclusion attitudes of general and special education preservice teachers. Teacher Education and Special Education, 36(3), 186-203.

McLeskey, J., & Waldron, N. L. (2002). Professional development and inclusive schools: Reflections on effective practice. Teacher Education and Special Education, 25(1), 27-41.

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

Miller, G. A. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. Psychological Review, 63(2), 81.

Oakley, B. (2014). A Mind for Numbers: How to Excel at Math and Science (Even if You Flunked Algebra). TarcherPerigee.

Okolo, C. M., & Diedrich, J. (2014). Twenty-five years later: How is technology used in the education of students with disabilities? Journal of Special Education Technology, 29(1), 1-20.

Paris, S. G., & Winograd, P. (1990). Promoting metacognition and motivation of exceptional children. Remedial and Special Education, 11(6), 7-15.

Piticari, P. (2023). Chestionarul UDL pentru profesori. Teză de doctorat nepublicată. Universitatea din București.

Pressley, M., Symons, S., McDaniel, M. A., Snyder, B. L., & Turnure, J. E. (1987). Elaborative interrogation facilitates acquisition of confusing facts. Journal of Educational Psychology, 79(3), 273.

Rao, K., Tanners, A., & Rodriguez, J. (2017). Teaching universal design for learning to pre-service teachers: An exploration of faculty-driven professional learning communities. Journal of the Scholarship of Teaching and Learning, 17(4), 22-39.

Ritchhart, R., Church, M., & Morrison, K. (2011). Making Thinking Visible: How to Promote Engagement, Understanding, and Independence for All Learners. Jossey-Bass.

Roediger, H. L., & Butler, A. C. (2011). The critical role of retrieval practice in long-term retention. Trends in Cognitive Sciences, 15(1), 20-27.

Rose, D. H., Meyer, A., & Hitchcock, C. (2005). The Universally Designed Classroom: Accessible Curriculum and Digital Technologies. Harvard Education Press.

Schunk, D. H., & Zimmerman, B. J. (2007). Influencing children's self-efficacy and self-regulation of reading and writing through modeling. Reading & Writing Quarterly, 23(1), 7-25.

Smith, K., Davis, A., & Way, S. (2018). Teaching "learning how to learn": Metacognition in primary school classrooms. Journal of Educational Research, 111(5), 482-494.

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

Stoeger, H., & Ziegler, A. (2008). Evaluation of a classroom-based training to improve self-regulation in time management tasks during homework activities with fourth graders. Metacognition and Learning, 3(3), 207-230.

The jamovi project (2022). jamovi. (Version 2.3) [Computer Software]. Retrieved from https://www.jamovi.org.

Torgesen, J. K., Alexander, A. W., & Wagner, R. K. (2001). Importance of learning to read. Journal of Learning Disabilities, 34(4), 381-390.

Veenman, M. V. J., Van Hout-Wolters, B. H. A. M., & Afflerbach, P. (2006). Metacognition and learning: Conceptual and methodological considerations. Metacognition and Learning, 1(1), 3-14.

Weinstein, C. E., Acee, T. W. (2013). Helping college students become more strategic and self-regulated learners. In H. Bembenutty, T. J. Cleary, A. Kitsantas (Eds.), Applications of Self-regulated Learning across Diverse Disciplines: A Tribute to Barry J. Zimmerman (pp. 197-236). Information Age Publishing.

Weinstein, C. E., Acee, T. W., Jung, J. H. (2011). Self-regulation and learning strategies. New Directions for Teaching & Learning, 2011(126), 45–53. http://dx.doi.org/10.1002/tl.443.

Weinstein, C. E., Mayer, R. E. (1986). The teaching of learning strategies. In M. Wittrock (Ed.), Handbook of Research on Teaching, third ed. (pp. 315-327). Macmillan.

Weinstein, C. E., Husman, J., Dierking, D. R. (2000). Self-regulation interventions with a focus on learning strategies. In M. Boekaerts, P. R. Pintrich, M. Zeidner (Eds.), Handbook of Self-regulation (pp. 728-747). Academic Press.

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. Theory Into Practice, 41(2), 64-70.