Supplementing Multiple Modalities and Universal Design in Learning with Goal-Setting

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ABSTRACT

The basic idea of this paper is that the principles of proper goal-setting should supplement application of the principles of Universal Design in Learning (UDL) and pedagogic challenge to instruction. 1) The concept of pedagogic challenge is well understood. The pedagogic hierarchies of Bloom, Anderson, Gagne, Van Hiele, and Marzano give precise characterizations of pedagogic challenge. Hendel has recently advocated a unified view of these pedagogic theories. 2) Similarly, the concept of Universal Design in learning by which the same content is presented to different students in different modalities making the learning experience universal is fairly well understood. 3) The concept of proper goal-setting, that is the proper sequencing of a learning task into component subtasks in such a way as to maximize learnability is also fairly well understood, however, it is not often discussed or applied. This paper reviews the basic ten attributes of goal-setting and supplements this review with experiments highlighting the efficacy of certain techniques. The paper concludes by reviewing three learning domains–mathematics, chess, and writing-where goal setting can change our perspective on proper teaching.

Keywords: Pedagogic excellence, Universal Design in Learning, Goal-setting, Chess Pedagogy, Factoring, Writing, Prayer Composition

1. INTRODUCTION AND GOALS

This paper encourages placing emphasis on *goal-setting* (GS) in addition to the current emphasis on *pedagogic challenge* (PC) and *universal design in learning* (UDL) when designing an instructional experience. Examination of current pedagogic processes shows that PC and UDL are often emphasized at the expense of, or simply without, GS.

To clarify our thesis we briefly define the terms GS, PC, UDL.

- Pedagogic challenge (PC):
  - If I simply teach that *rate* is *distance* divided by *time*, for example, a 210-mile trip driven in 3 hours indicates a rate of 210/3 = 70 miles an hour, then I have simply taught a raw fact, knowledge.
  - Contrastively, if I teach that *rate* can be used to predict time needed and facilitate scheduling, for example, if I have to make a 2-hour meeting starting at 10 AM in a city 210 miles away, then I can predict that I should start at 6:30, so that my expected arrival will be around 9:30, 3 hours later if I travel at 70 miles per hour, and that after the 2-hour meeting starting at 10 AM (and therefore ending at 12 AM), I am expected to return at 3:30 PM (3 hours x 70 miles per hour starting at 12 and giving time for rest stops), if I so teach that rate can be used to predict and schedule, then I have taught using application and analysis, and I have taught at a pedagogically challenging level (PC). A collection of pedagogic attributes-for example, *knowledge, application, analysis*-is known as a pedagogic hierarchy. A person using the pedagogic hierarchy knows that earlier mentioned attributes are low-level pedagogy while later mentioned attributes are higher-level pedagogy and therefore pedagogically challenging. Pedagogic hierarchies have been produced by Bloom[4], Anderson[1], Gagne [7], Van Hiele [28], and Marzano[20]. Hendel [9] offers a unified approach.
- Universal Design in Learning (UDL):
  To use the rate example just presented:
  - If I teach at the blackboard that *rate = distance / time*, present the formula, and do many examples, including the scheduling example just presented, then I have only taught with one modality, *visual* with *auditory support*
  - But I can also teach using multiple modalities. I can offer each student a different way of learning. For example, I can: i) use a kinesthetic approach by taking students in a car trip and have them learn during the trip how rate has a formula and helps in scheduling, ii) prepare PowerPoint slides and iii) YouTube type videos. By teaching using multiple modalities, I can access a wider, a universal, set of students some who may prefer to learn kinesthetically then visually. In this case I have *designed* my *learning* with a target of *universal* access (UDL), [21,25]
- Goal Setting (GS): Consider the instructional task of teaching students to throw darts. Further suppose, that the ultimate goal is pedagogically challenging, for example, a sufficient accuracy to participate in a serious competition, and that multiple modalities of instruction are used, for example, witnessing expert models, videos, PowerPoint, lectures on technique etc. Despite the presence of PC and UDL, something is missing, namely, proper goal-setting (GS). Here are five ways to set goals using the same instructional variety, UDL, and the same PC:
  I. No Goal: Just tell the trainees that the goal is to get as good as possible.
  II. Pure Outcome: Tell the trainees that to compete seriously they will have to get 99% of dart throws on target at a rate of 40 throws in 10 minutes.
  III. Process Specificity: Explain, that success is enhanced by using three stages in every throw: i) visual sighting of goal, ii) proper throwing position, and iii) actual throwing.
  IV. Plus Feedback: Enhance the process specificity with feedback to the trainee after each throw clarifying

what was done correct and what can be improved.

V. Process-Outcome: First spend time till trainees are proficient in the three stages of successful dart throwing; after they have achieved this, encourage them to focus on pure outcomes (speed and rates).

Goal-setting theory teaches us that these five methods have significant differences in i) accuracy, ii) speed, iii) trainee satisfaction, iv) trainee interest and v) trainee self-perception of self-efficacy between these five methods. The basic experimental results are that the higher number approach achieves more in these five areas. For example, method V, process-outcome, achieves more than method IV, Plus Feedback. Goal-setting teaches us the importance of, and how to, break a task, dart-throwing, into component subtasks in such a way that success and satisfaction is facilitated [15,16].

Having clarified the meaning of PC, UDL and GS, we restate this paper's main thesis: In our schools, in teacher preparation, and in instructional design, there is too much emphasis on PC and UDL with little co-emphasis on proper GS. Everyone is familiar with the 50 years of pedagogic hierarchies– Bloom [4], Anderson [1], Gagne [7], Van-Hiele [28], Marzano [20]–as well as Hendel's unified approaches to these hierarchies [9] based on Hughes Hallet's reform of Calculus [13]. Similarly, everyone is familiar with the plethora of modalities, auditory, kinesthetic, and visual including blackboard, powerpoint, and videos. Furthermore, people are familiar with the three pillars of UDL, variety in motivational student interest, variety in instructional presentation and variety in student assessment [21,25].

Against this background, the ten pillars of goal setting [18,19] remain orphaned. K-12 teachers and college professors are not routinely trained in them. Additionally, there is a vast and beautiful literature of well-designed, clever, but focused experiments highlighting the power of proper GS.

This in fact is the goal of this paper, to make instructors aware of GS theory. Accordingly, in Section 2, we present GS theory and then in Section 3 we present experiments illustrating the basic concepts of GS. In the remaining sections of the paper we explore examples. We first show a topic in K-12 mathematics that should not be in the curriculum because it violates GS theory. We then show the success of Chess pedagogy because it uses GS. Finally, we explore essay writing and poem-prayer composition, areas where some approach pedagogy through GS while others do not.

It is hoped that the exposure to theory and the exploration of examples will encourage instructors to consider using this tool.

2. GOAL SETTING (GS) THEORY

2.1 Theory: In the past few decades there has been a lot of literature, research and experiments on goal-setting [18,19]. Good goal setting should have ten attributes. These ten attributes of GS are listed below with examples from the five approaches to sub-tasking dart-throwing presented in Section 1: no -goal (I), pure outcome(II), process specificity (III), plus feedback(IV), and process outcome (V). In reviewing these attributes, notice that the initials of the first five attributes spell, SMART, a mnemonic associated with GS.

- *Specific*, that is, goals that are specific produce better performance and trainee satisfaction than non-specific goals. This is illustrated by the contrast of the process specific approach to dart throwing (III) vs. the non-specific approach of 'get a good score' (II).
- *Measurable*, that is, subtasking with measurability produces better performance and trainee satisfaction than non-measurable subtasks. Pure outcome (II) with an emphasis on score vs no-goal (I) illustrates how measurability improves performance and satisfaction.
- *Attainable*, that is, subtasks attainable by the trainees produce better performance and trainee satisfaction than non-attainable vague subtasks. Process specificity (III)-sighting the goal, positioning oneself and proper throwing-vs. pure outcome (II) of achieving a high score and rate illustrate this.
- *Realistic*, that is, subtasks whose outcomes are realistic produce better performance and trainee satisfaction than non-realistic tasks. The contrast between the realistic goals of III–sighting, positioning, and throwing–vs. the unrealistic goal of II, achieve 99% accuracy in 40 throws every 10 minutes, illustrates this.
- *Timely achievable*, that is, a subtask that can be accomplished in a short amount of time achieves better performance and trainee satisfaction then vague or long-term goals. The subtasks of sighting, positioning and throwing (III) vs. the vague subtask of achieving 99% accuracy and a speed of 40 throws in 10 minutes, illustrate this.
- *Clarity*, that is, subtasks that are clear produce better performance and trainee satisfaction then unclear subtasks. The subtasks of sighting, positioning and throwing (III) vs. the vague subtask of 'do your best' (I) illustrates this.
- *Challenge*, that is, subtasks should be simultaneously challenging and doable. The process outcome approach with a demanding 99% accuracy and 40 throws in ten minutes (V) vs. a task which just teaches component skills, sighting, positioning and throwing (II), illustrates this.
- *Commitment*, that is, there is superior performance if trainees have a commitment to training. This is illustrated by the results indicating that trainee satisfaction and interest (and hence resultant commitment) increase as we go from approach I to approach V.
- *Feedback*, that is any approach results in superior performance and trainee interest if supplemented by feedback after each trial. This is illustrated by the plus feedback approach (IV) vs. process specificity (III).
- *Task complexity*, that is, subtasks with a certain richness and complexity, provided they are attainable in a short amount of time, produce better performance and trainee satisfaction then overly simple subtasks.

I suggest grouping these 10 attributes into three categories as follows:

- *Specific*: This category subsumes the attributes of *specific, measurable,* and *clarity*. Notice that for dart throwing, the three subtasks of sighting, positioning and throwing (III) are not measurable per se but are specific and clear. For this reason I prefer the term *specificity* to *measurability* [9].
- *Proximate*: This category subsumes the attributes of *attainable, realistic, timely achievable, commitment,* and

feedback. The idea here is that if something is *proximate*, then it is achievable *short term* and a *realistic* goal. It is also something that is easy to *commit* to and for which the trainee actively seeks *feedback*. Contrastively, a non-attainable goal may discourage feedback and commitment because of time constraints.

- *Challenging*: This category subsumes the attributes of *challenge* and *task complexity*.

3. ILLUSTRATIVE EXPERIMENTS

This section presents several experiments supporting the GS thesis that *specific, proximate* and *challenge* are important GS principles. In each experiment below, there are typically two (or more) groups being treated (two or more treatments) with the treatments differing in one attribute. The experiment proves its results by noting superior performance and trainee satisfaction in the treatment that is specific, proximate or challenging.

3.1 Dart Throwing [15,16]: We first review this important set of experiments presented above in Section 1. There we presented 5 treatments of subtasking or goal setting. As indicated, using the metrics of performance (number correct), speed (minutes per dart throw), and trainee satisfaction, treatment V worked best, treatment VI worked better than treatment III which worked better than treatment II which worked better than treatment I. We summarize the inferences of comparison of treatments in the following bulleted list. As can be seen, the five treatments show the superiority of specificity, proximity and challenge.

- Outcome goal (II) vs No-Goal (I): A *specific measurable* outcome goal–for example, target a particular percent of successes, enhances performance.
- Specific Process (III) vs. Outcome Goal (II): Identification of *specific* techniques is superior to simply aiming for a high outcome and score.
- Plus Feedback (IV): Any treatment is always enhanced with *feedback* since feedback removes guesswork and thereby facilitates proximity
- Process-outcome (V) vs. Specific Process(III): Coupling specific technique with the *challenge* to achieve a high score produces better results than simply giving specific techniques.

In the rest of this section, we present experiments grouped by the three categories of GS attributes: Specificity, proximate and challenge.

3.2 Specificity: The following bulleted list presents a number of experiments to different age groups, different content domains and different skill levels. In each case the treatment with a specific goal produced better results. The diversity of the set of experiments illustrates the point that even light specificity, for example, do a specific number of problems, results in superior performance. However, as seen in the dart throwing experiment, goals with specific process techniques are even better.

- Reading instruction to children [6]. Three treatments were given, i) teacher-student conferences where goals were set, ii) teacher-student conferences where however no goals were set and iii) groups with no conferences and goals. Group (i) performed the best.
- Junior high-school students learning spelling and mathematics problems [26]. One treatment asked the students to select their own problems and words and predict in writing how well they would do on assessment while the other group had no such treatment. Goal-setting students expended more effort and had more realistic goals.
- Children lacking division skills. Experiments-giving a specific number of problems to complete vs. an unspecific goal of work hard-were performed on elementary school children learning arithmetic [24] and on students learning English for a second language (EFL) students [5]. The goal-oriented groups performed better.

3.3 **Challenge [22]:** The more challenging the subtasks, provided they are achievable, the higher the performance. Thus, in teaching long division, a simple challenging treatment of requesting a greater number of problems to do in a given amount of time vs. a control group which was given a specific but much lower number, resulted in superior performance

3.4 **Proximate**: Recall that proximity includes all items facilitating timely achievement of goals including, i) short term goals, ii) realistic goals, iii) feedback, and iv) commitment.

- Teaching long division to K-12 students [22, 23]: One treatment consisted of a challenging goal while the other coupled the challenging goal with a statement of *attainability*, that is, the students were informed that other students had completed this number of problems. The group with informed *attainability* achieved better performance, because their tasks looked more realistic.
- Children with low subtraction skills were given a set number of problems to complete [3]: One group was given a goal of completing a set of problems every day (*short term* goal) while the other group was given a goal of completing the problems by the end of the training period (long term goal). The short-term-goal students performed better
- College students operating an ergometer pursued a challenging goal of improving performance [2]: The group which additionally received *feedback* during performances performed better.

The experiments in this section point to the attributes of *short term, attainability*, and *feedback*. The point of view of this paper is that attainability and feedback increases proximity (accomplishing short term). However, we have brought all experiments to accommodate other points of view.

4. FACTORING

In the rest of this paper we explore application of the GS theory. We show one negative, one positive and one neutral example. In this Section 4, we argue that factoring should not be part of the K-12 curriculum. Then in Section 5 we show the excellent emphasis on GS in chess pedagogy. Finally, in Section 6 we show that writing is traditionally approached in two ways, one holistic and one using GS.

4.1 **Linear Equations [27]**: To present the difficulties with factoring we first contrastively present the teaching of the linear equation. This is well understood with a clear GS breakup of tasks. Let us show some simple subtasks based on the equation *rate x time = distance.* We already, in Section 1, presented the example of taking 3 hours to travel 210 miles at 70 miles per hour.

We can express this in terms of a problem with an unknown: $3R = 210$. In words, *what rate will enable me to travel 210 miles in 3 hours*. One can solve this equation by division as follows: $R = 210/3 = 70$.

One can solve other equations using this division technique. For example, the equation $4R = 200$ is solved using division to obtain $R = 200/4 = 50$.

There are other techniques involved in solving linear equations. For example, the equation $2X+3 =13$ would be solved by subtracting 3 from both sides of the equation transforming it into $2X=10$ and then applying division to obtain $X = 10/2 = 5$. Other equations that can be solved using the subtraction and division technique are $10X+5 =105$ (so $X=10$) or $20X+7= 147$ (so $X=7$), etc.

Thus, the general goal of teaching solving linear equations can be met by using process specificity and teaching proficiency in the subtasks of mastering the subtraction and division techniques. The addition of other techniques is also possible.

4.2 **Factoring [11]**: Contrastively, factoring quadratic functions has no sequencing of tasks that would facilitate learning it. Consider a simple quadratic function such as $X^2 - 5X + 6$. To factor this equation, one has to find two numbers *a, b* such that $X^2 - 5X + 6 = (X - a)(X - b)$. One can go a step further and expand this product: $(X - a) (X - b). = X^2 - (a + b) X + ab$. This means we must *find two numbers whose product is 6 and whose sum is 5.*

There is no simple way to do this. Some students have an innate ability to do this while others do not. This creates a polarized division of the classroom based on innate talent rather than based on effort and skill. Such a polarization in turn, may push otherwise talented people away from mathematics [11].

This factoring example can be duplicated at a more difficult level. For example the quadratic function $12X^2 + 2X - 2$ requires a factorization of the form $(aX + b) (cX + d)$. Here one must find four numbers such that the product $ab = 12$, $cd = -2$ and $bc + da = 2$.

The point being made here is that there is no set of subtasks, with the attributes of specificity, achievability in a short time and challenging, which will enable someone to learn to factor. There are no textbooks that present such a sequence.

We therefore argue that proper goal setting requires that factoring be removed from the K-12 curriculum. This is not as rash as it sounds since solving a quadratic equation can be taught with proper goal setting and inferring the factors of a quadratic function is straightforward based on its roots. However, factoring should be taught as a consequence, rather than as a driving force, to quadratic solutions.

5. CHESS

Although Chess is only a game, it is a rich game. It has a history that should be of interest to pedagogists.

Historically, Chess was one of the first disciplines to change from a person-based to a skill-based approach. Therefore, some historical background is presented.

Historically, chess went through what historians call the *romantic* era. During this era, excellent chess players were considered to have achieved their level of play because of innate genius. It was William Steinitz who helped change the direction of chess theory and instruction from a person-centered approach to a skill-centered approach. Steinitz accomplished this by changing the emphasis of theory from *combinatorics* to *positional* play [12, 17].

A combination is a sequence of moves with certain (more or less) forced outcomes [29]. The combinatoricist typically can see many moves in advance and hence the combinatoricist appears to be a genius. Very often, combinations involve giving up pieces and yet results in a win. During the romantic era, the method of play was combinatoric. The games that were won always had an element of surprise and aesthetic appeal, hence the name *romantic era.* The players that won these games were considered geniuses because of their ability to carefully think several moves in advance and to understand all possible responses.

Steinitz introduced the idea of *positional* play. In positional play, the primary emphasis is not on looking ahead. The idea of positional play is that certain squares on the chessboard are *worth more.* If a player has pieces on these squares, or, if a player has pieces that can move to or control these squares, that player has a positional advantage. Steinitz wrote extensively and showed that combinations happen in positions with positional advantage and typically do not happen in positions without positional advantage.

Since the attributes that make up good positions (control of certain squares) could be taught, it followed that winning chess was an attainable skill. One should not look for combinations unless one first has a positional advantage. If one does have a positional advantage, the combination will follow.

Today all chess theorists and instructors acknowledge the need for an approach to games using both combinatorics and positional analysis. We may regard this as a two-step subtasking of the general goal of learning chess.

Dr. Lasker [17], a world chess champion proposed a pedagogy program for chess, taking 200 hours, based on six distinct subtasks:

- Rules of play – 5 hours
- Some Openings – 10 hours
- Elementary endings – 5 hours
- Combinations – 20 hours
- Position Play – 40 Hours
- Play and Analysis – 120 hours.

This subtasking of learning chess into six specific and clear sub-goals is accepted by everyone (though Lasker's over-ambitious learning times are not accepted by everyone). Just to be clear, one can find books individually devoted to the openings, endgames, combinations and positional play. These books taxonomically break the particular subtask into further distinct specific subtasks.

The popularity of Chess is in part due to this recognition that success is due to effort, allowing people to achieve their chess goals by expending enough effort.

From the point of view of this paper, Chess should be considered an excellent example of pedagogy since it uses multiple modalities, sequences correctly and has developed its own unique genre of universal design.

6. WRITING

In this section, we focus on essay writing and poetic-prayer composition. There are two fundamental approaches to these activities. One approach is holistic. Holism contradicts subtasking and sequencing. Holism would look at poetic-prayer composition as a deeply personal emotional statement. Similarly, essay writing is seen by some as a holistic experience. While some structure, such as paragraphing, helps, the emphasis is on a holistic approach.

Contrastively, there are approaches that emphasize subtasking and sequencing. For example, the Jones-Faulkner text [14], a classic college textbook teaches essay-writing by sequencing subtasks into the following skill sequences:

- **Four methods of *pairing* sentences**
  Enumerative, Equal, Subsidiary, Dominant
- **Pairing Sentences→ Subsidiary meaning→**
  Definition, Amplification, Sample Item, Item List, Sample Facts, All facts, Cause, Data Support, Analogy
- **Five methods of Paragraph Development**
  Enumerative, Equal pair, Unequal pair, Simple Chain, Dividing Chain

Let us clarify with an example. According to Jones-Faulkner the fundamental subtask of essay writing is joining and combining, *pairing*, sentences. The combined sentences then form paragraphs which in turn form essays.

There are four main methods of *pairing* sentences. Each of them is a specific subtask. One of the methods is *subsidiary* in which the 2nd sentence serves the 1st sentence by clarifying some fact. Jones-Faulkner list nine subtasks of the *subsidiary* method. *Sample item* is one subtask of the subsidiary method. An example of *sample item* would be the following pair of sentences. (1) *Roses are known for their beauty and diversity.* (2) *For example, yellow roses traditionally symbolize friendship and cheerfulness.* Here, sentence (2) lists a *sample item* of sentence (1); this in turn illustrates the *subsidiary* relationship.

The Jones-Faulkner approach emphasizes mastery of essay composition through mastery of these specific subskills. In the Jones-Faulkner textbook, each subskill is accompanied by explanations and exercises allowing that mastery. This contrasts to a holistic approach to writing.

A similar approach can be applied to poetic-prayer composition [10]. Hendel advocates teaching composition of prayers for *petitionary help* using the five subtasks that Gunkel [8] identifies in the petitionary Psalms: i) Description of God's power, ii) statement of complaint, iii) supplication for help, iv) argumentation for receiving help, v) thankfulness and conviction that one's prayers have as it were already been heard and the person is saved.

Needless to say, between the personal holistic approach and the almost mechanical goal-setting approach, there are intermediate approaches. The focus of this paper is that however emotional and personal a subject matter domain is, the superior pedagogic approach should use goal-setting.

7. CONCLUSION

This paper has advocated goal-setting, the sequencing of an educational goal into a sequence of subtasks that are specific, achievable short-time and challenging, as an important supplement to use of the pedagogic hierarchies. The paper explored the ten attributes of goal setting and has advocated three major categories. Experiments showing the superiority of the GS approach have been presented. We reviewed three pedagogic areas and their relationship to GS: i) Chess is an excellent example of GS; ii) factoring is an example of a skill that cannot be goal-set and should therefore be dropped from the curriculum; iii) essay writing and poetic-prayer composition, despite their holistic flavor, can successfully be approached using goal setting. It is our hope that the ideas in this paper will inspire instructors to employ GS principles in their instructional design.

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8. REFERENCES

[1] L. W. Anderson & D. R. Krathwohl (Eds.), **A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives**, NY: Longman, 2001.

[2] A. Bandura & D. Cervone, "Self-evaluative and self-efficacy mechanisms governing the motivational effects of goal systems," **Journal of Personality and Social Psychology**, 45, 1983, pp. 1017-1028.

[3] A. Bandura & D. H. Schunk, "Cultivating competence, self-efficacy, and intrinsic interest through proximal self-motivation," **Journal of Personality and Social Psychology**, 41, 586-598, 1981.

[4] B. Bloom, **Taxonomy of Educational Objectives: The Classification of Educational Goals,** NY: Longman,1956.

[5] S. M. Chang, "The effect of specific goals on EFL students' self-efficacy and performance on vocabulary learning," **NCUE Journal of Humanities**, 5(1), 2012, pp. 53-74.

[6] J. P. Gaa, "Effects of individual goal-setting conferences on achievement, attitudes, and goal-setting behavior," **Journal of Experimental Education**, 42, pp. 22-28, 1973.

[7] R. M. Gagne, **The conditions of learning and theory of instruction** (4th ed.), New York, NY: Holt, Rinehart and Winston, 1985.

[8] H. Gunkel, T**he Psalms: A form-critical introduction**. Philadelphia, PA: Fortress Press, 1967

[9] R. J. Hendel, **Leadership for Improving Student Success through Higher Cognitive Instruction**, in **Comprehensive Problem Solving and Skill Development for Next-Generation Leaders,** R. Styron and J. Styron, (Eds.), Hershey, PA: IGI Publishing, 2017.

[10] S R. J. Hendel, “Enriching the Prayer Experience through Writing Psalms,” **Jewish Educational Leadership**, 16(1), 2017.

[11] R. J. Hendel, "Are We Meeting the Requirements of Pedagogic Excellence? The Quadratic Equation," **Journal of Systemics, Cybernetics, and Informatics,** To appear, 2017.

[12] David Hooper, “Steinitz' Theory,” **British Chess Magazine,** 104, 1984, p. 370.

[13] D. Hughes-Hallett, W. G. McCallum, A. M. Gleason, E. Connally, D. Lovelock, C. Patterson, & T. W. Tucker, **Calculus: Single and Multivariable** (6th ed.), Hoboken, NJ: Wiley, 2013.

[14] A. E. Jones & C. W. Faulkner, **Writing Good Prose: A Simple Structural Approach** (4th ed.), New York, NY: Scribner, 1977

[15] A. Kitsantas & B. J. Zimmerman, "Self-regulated learning of a motoric skill: The role of goal-settingand self-monitoring," **Journal of Applied Sport Psychology**, *8*(1), 1996, pp. 60–75.

[16] A. Kitsantas & B. J. Zimmerman, "Developmental phases in self-regulation: Shifting from process goals to outcome goals," **Journal of Educational Psychology**, *89*(1), 1997, pp. 29–36.

[17] Emanuel Lasker, **Lasker’s Manual of Chess**, Dover,1960.

[18] Edwin A. Locke & Gary P. Latham, **A Theory of Goal Setting and Task Performance,** New York, NY: Pearson College Division, 1990.

[19] Edwin A. Locke & Gary P. Latham, **New Developments in Goal Setting and Task Performance,** New York: Routledge, 2013

[20] R. Marzano, **Designing a New Taxonomy of Educational Objectives**, Thousand Oaks, CA: Corwin Press, 2001.

[21] **National Center on Universal Design for Learning,** http://www.udlcenter.org/

[22] D. H. Schunk, "Developing children's self-efficacy and skills: The roles of social comparative information and goal setting," **Contemporary Educational Psychology**, 8, 1983, pp. 76-86.

[23] D. H. Schunk, "Goal difficulty and attainment information: Effects on children's achievement behaviors," **Human Learning,** 2, 1983, pp. 107-117.

[24] D. H. Schunk, Goal setting and self-efficacy during self regulated learning, **Educational Psychologist**, 25, 1990, pp. 71-86.

[25] E. Stein, **Elevating Co-Teaching Through UDL,** Wakefield, MA: Cast Professional Publishing, 2016.

[26] N. Tollefson, D. B. Tracy, E. P. Johnsen, A. W. Farmer, A. W., & M. Buenning, "Goal setting and personal responsibility training for LD adolescents," **Psychology in the Schools**, 21, 1984, pp 224-233.

[27] University of Chicago School Mathematics Project and J. Flanders, **Advanced Algebra (**3rd Edition**)**, Chicago, IL: McGraw Hill, 2010.

[28] P. Van-Hiele, **Structure and Insight: A Theory of Mathematics Education**, Orlando, FL: Academic Press, 1986.

[29] Eugene Znosko-Borovsky, **The Art of Chess Combination,** Dover Publications, 2013.