

The current HE classroom: promoting new types of learning, executive function processes and strategies to foster students' motivation and academic success

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Abstract

Students' academic success in this digital, globalized era requires their mastery of processes such as goal setting, planning, prioritization, organization, flexibility to change, storage/manipulation of information in working memory, and self-monitoring. These processes are called executive function (EF) processes. It is important to integrate strategies that systematically address these processes in the classroom to help students understand how they think and how they learn. This paper provides a paradigm for understanding/helping students integrate strategies involving EF processes; it describes how strategic, systematic instruction and adaptations to classroom-work and tasks may benefit all students, while effectively addressing the needs of students who exhibit significant weaknesses in these processes. Furthermore, individuals and organizations involved in HE express the need for other important types of learning that do not readily emerge from Bloom's taxonomy: e.g., learning to learn, leadership, interpersonal skills, ethics. This paper introduces D. Fink's proposal for a broader taxonomy of significant learning.

Keywords: *Pedagogical engineering approach; executive function processes; Dee Fink's Taxonomy of Significant Learning; new learning/teaching strategies.*

1. Introduction

Research (e.g., Bandura, 2000; Brunstein, Schultheiss, & Grassman, 1998; Helliwell, 2003; Kasser & Ryan, 1996; Meltzer, Reddy, Sales Pollica, & Roditi, 2004b; Pajares & Schunk, 2001) shows that academic success for all students, is inextricably linked to their motivation, effort, persistence, academic self-concept, and self-efficacy. Their academic success in this digital and globalized era requires their mastery of processes such as goal setting, planning, prioritization, organization, flexibility to change, storing and manipulating information in the working memory, and self-monitoring. Such processes are referred to as executive function (EF) processes.

As educators, we need to realize that it is increasingly important not only to integrate strategies to systematically address these processes in the classroom to help students understand how they think and how they learn, but also that teaching, like all professions, should allow research to inform its practice. In this paper we provide a paradigm for understanding and teaching students strategies that integrate executive function processes. It describes how strategic and systematic instruction and adaptations to classroom work and assignments can benefit all students, while effectively addressing the needs of a large number of students who exhibit significant weaknesses in these processes.

As is currently known, individuals and organizations involved in HE are expressing the need for other important types of learning that do not readily emerge from Bloom's taxonomy, e.g., learning to learn, leadership and interpersonal skills, ethics, communication skills, character, tolerance, and the ability to adapt to change. This state of affairs requires a pedagogical engineering approach and new types of learning that go far beyond the cognitive domain of Bloom's taxonomy and even, beyond cognitive learning itself. It is also in response to this need that we present here Fink's proposal for a new and broader taxonomy of significant learning.

2. Executive Function

Executive Function (EF) refers to a family of control functions that are essential to concentrate, pay attention and think, when going on automatic, acting on intuition or the initial impulse may be ill-advised (Burgess & Simons 2005; Diamond, 2012). These functions depend on a neural circuit in which the prefrontal cortex plays a prominent role (Anderson, Jacobs, & Anderson, 2008; Craik, Bialystok, Gillingham & Stuss, 2018). There is general agreement (e.g., Miyake et al., 2000) that there are fundamental EFs: Attention; Inhibition or inhibitory control; working memory; and cognitive flexibility. These form the basis for higher-order EFs such as reasoning, problem solving, and planning (Christoff, Ream, Geddes, & Gabrieli, 2003; Collins & Koechlin, 2012; Lunt et al., 2012). Executive

function processes provide us with the “big picture” of a situation, a theme or a task at hand, and allow us to switch flexibly between this big picture and its relevant details.

There exist six processes that researchers (e.g., Christoff, et al. 2003; Collins et.al., 2012; Diamond, 2012; Diamond, 2012; Lunt et al., 2012; Meltzer, et al., 2004b; Meltzer & Krishnan, 2007) have found to be key to executive function: goal setting; planning and prioritizing; organizing; retaining and manipulating information in working memory; flexible switching; and self-monitoring and self-control. These processes are referred to as executive function processes, and are of vital importance to all aspects of academic performance because, since as we all know, students' academic success in this digital and globalized age requires not only their technological expertise but, more importantly, their mastery of the above-mentioned processes.

As educators, we may have occasionally noticed that “although some students demonstrate strong conceptual reasoning skills, these same students are inefficient with their work and have difficulty demonstrating what they know in the classroom; their study skills and test performance are compromised; and their academic grades do not reflect their actual intellectual capacity. What we are usually unaware of is that for these students having executive function weaknesses, their conceptual reasoning skills may be stronger than their production and productivity” (Meltzer, 2010, p.28). Meltzer et al., (2007) studies found that students with executive function challenges, have particular problems with academic tasks that involve the coordination and integration of different subskills, such as beginning writing tasks summarizing information; taking notes; studying; planning, executing, and completing projects on time; maintaining attention during long, detailed assignments; and remembering to submit their work on time. Furthermore, their problems with attention, working memory, and inhibition create additional challenges, and their productivity with classwork and homework is affected.

2.1. Why Are Executive Function Processes So Important?

Research (e.g., Bandura, 2000; Helliwell, 2003; Kasser & Ryan, 1996; Sheldon & Elliot, 1999), as already mentioned, has largely supported that academic success for all students, is inextricably linked to their motivation, effort, persistence, academic self-concept, and self-efficacy. These cognitive and motivational processes are connected with students' use of executive function strategies, as well as with their academic performance (Meltzer & Krishnan, 2007). As such, strategies that address executive function processes provide an entry point for improving academic performance. Along with Meltzer (2010) we argue that when students learn and apply these strategies effectively, they become more efficient and thus begin to succeed academically. Academic success in turn boosts self-confidence and academic self-concept, which results in more focused effort so that students' hard work is

targeted strategically toward specific goals. The learning environment and the instructional methods and materials all play an important role in mediating this cyclical relationship.

For all students, but particularly for students with learning and/or attention difficulties, effective strategies and focused effort will help them to bridge gaps between their skills and the academic demands they face (Meltzer et al.,2004b). In other words, their academic performance is often dependent on their knowledge of and willingness to use strategies. Students, therefore, need to understand their own learning styles. This will help them discover which strategies work well for them, as well as why, where, when, and how to apply each specific strategy. This understanding is referred to as metacognition, or the ability to think about one's own thinking and learning. Metacognition underlies students' use of executive function processes.

Executive function challenges may take different forms:

- Problems with Task Initiation involve procrastination or failing to do what we know we are supposed to do and, trouble transitioning from one task to another.
- Organizing, Planning and Prioritizing Weaknesses show up when the student has trouble committing to plans; waits until the last minute to start a project; underestimates time to complete a task; gets caught up in details and misses the "big picture".
- Poor Impulse Inhibition is made evident when the student talks before thinking; does not consider long-term impact of an action; and interrupts or blurs out socially inappropriate comments.
- Trouble Shifting Tasks implies having difficulty stopping an activity and moving to the next; having trouble tolerating unpredictable events or schedule changes; and becoming "stuck" on a particular line of thinking.
- Trouble with Emotional Control is associated with being over-reactive to small problems; easily upset and having trouble calming down; and unclear about what triggers an emotional reaction.
- Poor working Memory encompasses trouble with multi-step routines; problems following complicated group conversations and trouble multi-tasking at work.
- Trouble Keeping Material Organized show up when students have trouble keeping track of belongings, files; and their home and work environment is messy or disorganized.
- Poor Self-Monitoring Skills imply difficulty noticing careless errors; trouble reflecting on what works and what does not work; and poor awareness of others.

3. Importance of Teaching Explicit Strategies

3.1. For Goal Setting

Currently, to achieve an optimal balance between a curriculum-centered approach of education and a student-centered approach, teachers need to share the goal-setting process with their students, to help them become independent learners. Research findings (e.g., Pintrich & Schunk, 1996; Schunk, 1995, Meltzer, 2010) support the importance of teaching goal-setting strategies and also show (1) a strong cyclical relationship between the ability to set personal goals and sustain higher levels of motivation as well as the development of positive self-efficacy (which promotes success); (2) that students may be more motivated and interested when they engage in tasks of their choosing, and that they may work harder on self-made goals than they do when they work toward the plans and expectations of others; (3) that when teachers share the goal-setting process with students and give them appropriate guidance, students can learn how to set reasonable goals, which increases their motivation and willingness to persist.

Researchers (De la Paz, 2007; Graham, 2006 in Meltzer, 2010) suggested that when students learn to set effective personal goals, and when their learning is supported by meaningful feedback (self-assessment and teacher feedback) as well as by appropriate learning experiences and strategies, they show improvements in their academic performance. According to De la Paz, and Graham, given a complex process such as writing, students are more easily able to manage the multiple demands of the task when they learn how to self-regulate their efforts through goal setting and planning. Research evidence also shows that this is true both for typically developing students and for students with learning challenges (Carlson, Booth, Shin, & Canu, 2002, in Meltzer, 2010). Indeed, while all students benefit from learning how to set goals, students who struggle with academic tasks benefit even more.

3.2. Some Strategies to Help Students Setting Goals

Meltzer (2010) argues that “given the pace of the curriculum, the diversity of learning styles represented in the classroom, and the large volume of content, many educators find it difficult to make the time to teach goal setting, as it is not a component of the content-centered curriculum” (p.81). Nevertheless, setting goals should be taught through classroom accommodations and direct, systematic instruction.

The following common instructional accommodations provide students with scaffolds that help them with goal setting. These accommodations constitute “best practices”.

- *Rubrics*: Allow students to have a clear idea of what the teacher is looking for and how performance may be assessed.

- *Visual representations of projects* completed by previous students (pictures or actual examples), can lead current students through a sample prior to giving them a similar assignment.
- *The use of calendars and phased timelines*- Calendars provide visual reminders of due dates, as well as schemas for setting and achieving short-term goals that contribute to the successful attainment of the larger, final goal (Newport,2006; Villa, 2018, 2021).
- *Direct, systematic instruction* allows students benefit from explicitly learning how to set goals. It entails three key components considered the most effective in goal setting:
- *Self-understanding/Self-knowledge* is an important component of a resilient learning style, which in turns ensures that students set reasonable and appropriate goals;
- *Grasp of the “big picture,” or schema*, with respect to broad goals for the year or the term, along with more specific content-or lesson-related goals, and
- *Valuing the task* –research (e.g., Villa, 2018, 2021) shows that it is essential to understand that individuals are motivated to achieve goals that are in line with their own strong desires and values; and that individuals have a deep-rooted desire to have an effect on their environment and to obtain results that they value within their own contexts.

Furthermore, self-determination theory suggests that people are motivated to act in a manner that is consistent with their values (Deci & Ryan, 2000). These are powerful drives that exist in all learners.

3.3. Strategies for Planning and Prioritizing

Planning and prioritizing are essential for success in today's classrooms. Current emphasis on long-term projects and expectations for independent work have increased the requirement for all students to plan and prioritize independently. Thus, students' ability to arrange tasks in order of importance and use strategies to complete them on time is directly related to their success and their ability to achieve their goals in all academic areas. Effective planning and prioritizing leads to efficient time management, which in turn increases productivity, relieves stress, and has a positive effect on student learning and performance (Misra & McKean, 2000 as cited in Meltzer 2010).

Time management involves interactions among several different executive function processes, including goal setting, prioritizing goals, planning goal achievement, and prioritizing tasks to accomplish objectives (Britton & Tesser, 1991). These processes are fairly complex for most students; therefore, it is important to begin by focusing on the foundational processes involved in time management: (1) Knowledge of time; (2) knowledge of task; (3) Prioritizing tasks; and (4) Monitoring progress. (Villa, 2021; Newport, 2006; Wolters, 2003).

Students who implement time management strategies are often considered to be more self-regulated, more aware of their thinking processes, and more able to manage their learning across contexts than those who procrastinate (Wolters, 2003). Efficient time management is a combination of innate abilities and learned strategies. However, the challenges of time management have become increasingly complex. Daily packed schedules and “timeless” distractions like video games and social networking sites (e.g., Facebook and MySpace), can easily reduce a student’s task efficiency and productivity.

3.4. Strategies for Accurate Time Estimation

Students often make independent choices about the order in which they will approach their tasks and how they will schedule their time. Although they typically have established routines, students often do not reflect on the efficiency of their habits. (Villa, 2021).

Educators can support the ongoing development of accurate estimation skills by providing structured opportunities for reflection after tasks (Teaching assistants may guide this exercise). For students to allot adequate time to complex projects, studying for tests, or even accomplishing everyday tasks (e.g., eating lunch, includes preparing food, or waiting in line to pay for it) they need to learn strategies for doing so. Perfecting the ability to estimate the time required for a task is a gradual process that improves with practice and age.

Educators can help students become accurate time estimators with estimation strategies such as:

- Dividing a large-scale project into its smaller components, and then estimate the time it will take to complete each part.
- How long will it take breaking the task down into multiple steps/estimate the time to allocate to each step.

By helping students get a clear understanding of the different types of activities (obligation, aspiration, and negotiation) in their daily lives, teachers can provide them with a method of prioritization that results in the creation of a productive and efficient schedule.

4. Concern Regarding University Teaching

Research (e.g., Fink, 2003, 2013; Saroyan, & Amundsen, 2004) reports concerns regarding learning goals not going beyond a understand-and-remember type of learning; professors having difficulty integrating additional activities to the lectures and discussions; and programs not considering the challenge and complexity of good teaching. Furthermore, the “get busy with research and publishing” pressure is considerable, even beyond tenure, to maintain strong research (and teaching) records.

5. Call for New Kinds of Learning

Research and leaders in business, industry and government have identified the so-called “critical competencies”, for the current societal needs, which include: (1) Conscientiousness, personal responsibility, and dependability; (2) Ability to act in a principled, ethical fashion; (3) Skill in oral and written communication; (4) Interpersonal and team skills; (5) Skill in critical thinking and in solving complex problems; (6) Respect for people different from oneself; (7) Ability to adapt to change; (7) Ability and desire for lifelong learning (e.g., Gardiner, 1994; Martin-OCDE, 2018; Luna Scott-UNESCO, 2015).

Individuals and organizations involved in higher education stress out that our current dynamic new world requires new kinds of learning. In this digital and globalized era students need to learn how to learn; to acquire and develop leadership and interpersonal skills, ethics, communication skills, character, tolerance, and the ability to adapt to change. Therefore, there is a pressing need for new kinds of learning that go well beyond the cognitive domain of Bloom’s taxonomy (1956, 2001), and even beyond cognitive learning itself. We need a new and broader taxonomy.

5.1. Defining Learning as Change

For learning to occur, there has to be some kind of change in the learner. No change, no learning. Learning is seen as a central underlying mechanism to acquire knowledge and skills, as well as long-term behavior change, which should positively impact performance (Campbell 1990; Hesketh & Neal 1999; Fink, 2003, 2023; London & Mone 1999 as cited in Attri, 2018). Significant learning requires lasting change that is important in terms of the learner’s life.

Fink (2003, 2013), presents a new vision of teaching in which students are engaged in their learning, resulting in a high-energy classroom and students experiencing meaningful and lasting change. In addition, it is presented as a value in life, since learning enhances students' lives and prepares them to participate actively and effectively as valued members of society.

This new vision involves: (1) Significant learning; (2) Integral course design; and (3) Better organizational support. A particular perspective on learning, defined in terms of change, guided D. Fink (2003) in the construction of this new taxonomy. Thus, for learning to occur, there has to be some kind of change in the learner. No change, no learning. With this perspective in mind Fink created a taxonomy with six kinds of significant learning (see Fig.3).

5.2. Major Categories of the Taxonomy of Significant Learning (L. Dee Fink, 2003, 2013)

Each category of significant learning contains several more specific kinds of learning that are related in some way and have a distinct value for the learner.

- **Foundational Knowledge:** Ability to understand & remember specific information and ideas. Value: Provides basic understanding necessary for other kinds of learning. (e.g., Pre-requisites).
- **Application:** Engage in some new kind of action: intellectual, physical, and/or social. Engage in various kinds of thinking critical, creative, and practical. Value: Allows other kinds of learning to become useful.
- **Integration:** Able to see and understand the connections between different things. Sometimes they make connections between specific ideas, between various learning experiences (e.g., between courses or entire disciplines), or between different areas of life (e.g., between school and work or between school and leisure life). Value: Gives students a new form of power: Intellectual power.
- **Human Dimension:** Learning about themselves and others; how and why others act the way they do; enables students to function, and interact with others more effectively. Discover the personal and social implications of what they have learned. New understanding of themselves (self-image) or new vision of what they want to become (self-ideal). Value: informs students the human significance of what they learn.
- **Caring:** A learning experience changes the degree to which students care. It is reflected in the form of new feelings, interests, or values. Value: Fosters in students the energy they need for learning more about something and making it a part of their lives.
- **Learning how to Learn:** Learn something about the process of learning itself. Learning how to be a better student; engage in a particular kind of inquiry; become a self-directing learner. Value: enables students to continue learning in the future and to do so with greater effectiveness

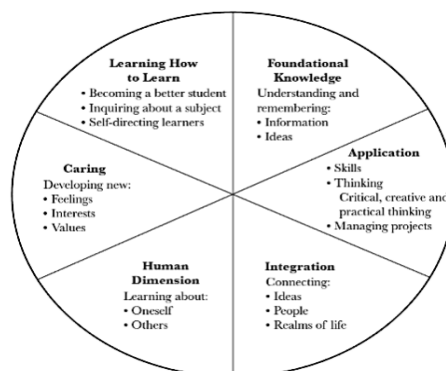


Figure 3. Taxonomy of Significant Learning. (Fink, 2013)

Regarding the course outcomes, it is quite reasonable to expect that educators who decide to adopt Fink's Taxonomy and set their general course objectives in terms of significant learning would greatly facilitate that at the end of the course in question, students will: *Understand and remember* key concepts, terms, relationships, and so on; know how to use the content; be able to *relate* this subject to other subjects; understand the personal and *social implications* of knowing about this subject; *care* about the subject (and about learning more about it); and *know how to keep on learning* about this subject after the course is over.

6. Conclusion

Faculty members are increasingly aware that something is missing in their teaching practice. Although they want their students to achieve higher levels of learning, they continue to use teaching practices that are not always effective in promoting such learning. Traditionally, they have relied heavily on lectures as the main form of teaching. There is a need to change the nature of the role of professors from being primarily lecturers to being professors primarily designers of significant learning and environments. It is undeniable that teaching, like all professions, should allow research to inform its practice. This requires facilitating that faculty acknowledge and accept research-based evidence showing that: (1) academic success for all students, is inextricably linked to their motivation, effort, persistence, academic self-concept, and self-efficacy; (2) academic success is closely connected to the strategies that support executive function processes to help students understand how they think and how they learn, while effectively addressing the needs of those students who show significant weaknesses in these processes; 3) academic success is also closely related to the effectiveness of strategic and systematic teaching and adaptation of work and tasks in the classroom; (4) there is a need for new and multiple kinds of specific learning by students, that is, something more than understanding and remembering subject-related information.

By integrating the Taxonomy of Significant Learning into their teaching practice, professors may realize that they can actually foster the acquisition and development of skills that do not readily emerge from the Bloom's taxonomy. Accordingly, pre- and in-service teacher education and updating programs should integrate these topics in their curricula, since as Hargreaves (2003) argues, and as educators all have noticed at some point, teachers tend to teach in the same ways they were taught.

"We won't meet the needs for more and better higher education until professors become designers of learning experiences and not teachers." —Larry Spence (2001).

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