SELF-REGULATION: A COMMENTARY ON DIRECTIONS FOR FUTURE RESEARCH

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These are exciting times for those of us interested in self-regulation, particularly in educational and training settings. The importance of conceptions of self-regulation for understanding human thoughts, behaviors, and emotions has never been more clearly recognized in both the research and applied educational domains. Although this recognition has created enormous opportunities for research and development at all levels of education and training, it has also created enormous pressure on the R&D community to move from a high level of relatively amorphous abstraction to clearer definitions and more concrete guidelines for application. We have reached a crossroads and to continue to move on we must address a number of important conceptual, research, and applied issues and questions. The work described in the four articles comprising this special issue of *Learning and Individual Differences* represent a meaningful step on this journey.

Rather than summarizing the large amount of creative and influential literature and data discussed in these four articles, I have chosen to use them as a base to help generate a series of suggestions designed to stimulate and offer some additional direction for future research in the area of self-regulation in educational contexts, broadly defined. I have categorized my remarks into eight clusters: conceptual models and frameworks, clarity and differentiation of terms, assessment of self-regulation, development and acquisition of self-regulation, contextual effects and interactions, interactions with knowledge and content domains, helping students to improve their self-regulation, and developing materials for instruction and teacher/trainer professional development.

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DIRECTIONS FOR FUTURE RESEARCH AND DEVELOPMENT

1. CONCEPTUAL MODELS AND FRAMEWORKS

In the introduction to this issue of *Learning and Individual Differences* Teresa Garcia pointed out that the invited articles represent two emphases in research in self-regulation: the self and regulation. This dichotomy, as well as others, such as internal and external regulation, need to be integrated into tentative multivariate models that can help bring some cohesion to the area and be used as departure points for future research and applications. The existing research and development work in the area of self-regulation related to student development, academic choices and behaviors, learning strategies, and achievement has often been cited as one of a few areas of work that uniquely define the domain of educational psychology as something different from Thorndike's definition of psychology applied to education. However, the historical development of our current conceptions of self-regulation can be traced back to a number of areas of psychological research, including developmental, cognitive, social, personality, and occupational psychology. This mixed lineage has been a mixed blessing: the field is definitely more robust from its diverse relatives but it is having difficulty defining itself as a unique family member. This difficulty will also be reflected in some of the following suggestions as well.

In our own work at the University of Texas my colleagues and I have developed a Model of Strategic Learning that emphasizes interactions among self-regulation, individual differences, learning strategies and study skills, motivation and beliefs, and context variables. This model underlies much of the research, development of assessment instruments, and educational interventions and teacher training conducted as part of the Cognitive Learning Strategies Project.

The work described in the articles in this volume has also been based on diverse but thematically-related models. In the Kanfer et al. article a model derived from an individual difference perspective is presented to account for a number of influences on self-regulatory processes aimed at sustaining on-task attention and effort management. Deci et al. describe a taxonomy of self-regulation derived from self-determination theory and pose both innate and acquired mechanisms by which self-regulation develops and operates. Wolters et al. present a taxonomy of goal orientations developed by Midgley, Maehr and their associates, and also work from a conceptual framework that emphasizes motivational beliefs, cognitive strategy use and self-regulation. Updegraff et al. use a framework in their study that combines individual differences, student beliefs and attitudes, and dimensions of self-regulation to examine choice behavior in an academic setting. Their predictors were selected from the Expectancy-Value Model of Achievement Choices developed by Eccles and her colleagues. Although each of these frameworks provides a means for thinking about self-regulation, there is still a need for more integrative models that can help us organize and interpret important aspects of self-regulation in learning contexts.

2. CLARITY AND DIFFERENTIATION OF TERMS

Having just cited a need for a more integrative model (or models) of self-regulation, I would also like to argue for a greater differentiation of the terms we use to discuss self-regulation. When I first worked for IBM many (many!) years ago, programmers were categorized into one of two groups: applications programmers and systems programmers. At the time, given the relative simplicity of the computer world, this made perfect sense. However, as the field developed, so did the number and meaning of the titles (I am told there are more than 60 today). This profusion of differentiating terms has allowed for a greater precision in defining job tasks and responsibilities and in communicating with prospective programmers about the nature of specific jobs and the preparation required. The explosion of interest, research, and applied work in the field of self-regulation, highlighted in each of the four papers in this issue, also requires a greater differentiation and definition of terms to allow a more precise and clear direction and means of communication among ourselves and for communicating with our target audiences at both the policy and applied levels.

Examples of a greater differentiation of the terms we use to discuss self-regulation can be found in the articles in this issue. The article by Deci et al. is an example of this type of work. Using self-determination theory they derive five types of regulation and explore the relations among them with educational variables such as achievement, retention, interest and enjoyment of school, anxiety, and methods of coping with failures. They also propose a further differentiation of motivation. Kanfer et al. expand the definition of self-efficacy for learning to focus on the trait-like dimensions that can impact performance in task-specific situations. In the Wolters et al. article the authors argue for a further differentiation of types of goal orientation and relate these different types to motivational beliefs, cognitive strategy use and self-regulation. Each of these approaches has produced important and useful data that can be used to help further the development of more precise terms and concepts to convey the nature and dynamic aspects of self-regulation.

3. ASSESSMENT OF SELF-REGULATION

Related to both of the issues just discussed is the need for better models and instruments or guidelines for the assessment of self-regulation and its components. Research directed toward the creation of assessments of self-regulation in learning contexts will help to develop our understanding, generate shared categorizations, and allow common methods of assessment across studies and evaluations of applications. In the study reported by Wolters et al. they used an adapted version of the Patterns of Adaptive Learning Survey developed by Midgley and her associates and the MSLQ, originally developed by Paul Pintrich and his colleagues at the University of Michigan for use in individual college classes. An adapted version for junior high school students was used for the data reported in their article. Kanfer et al. also used a version of the MSLQ that they reported adapting for use as a general measure across classes. Deci et al. used the ASRQ to measure types of extrinsic and intrinsic motivation.

A widely-used generic measure of learning and study strategies that we have developed at the University of Texas is called the *Learning and Study Strategies Inventory* (LASSI). LASSI is a 77-item, self-report screening assessment that helps college students identify their strengths and possible weaknesses in 10 different areas related to strategic learning and academic success: attitude and interest, motivation, time management, anxiety, concentration, information processing, selecting the main idea, study aids, self-testing, and test strategies. Both the MSLQ and the LASSI were derived from models of self-regulation and strategic learning. They are meant to be used as global screening measures which incorporate a number of variables related to studying, learning, and educational achievement. Further research is needed to expand the range of self-regulation domains and variables included in screening measures such as the MSLQ and LASSI, as well as develop more targeted measures specific to a knowledge domain, educational context, or type of self-regulation (e.g., the Motivational Skills measure described by Kanfer et al.)

In addition to expanding the range and depth of measures of self-regulation and its various interacting dimensions, we also need to broaden the age range for which these instruments are designed. Currently, both the LASSI and the MSLQ have college versions. The LASSI also has a high school version and the MSLQ also has a junior high school version. The ASRQ discussed by Deci et al. is designed for the middle childhood years and the trait measures used by Kanfer et al., including their Motivational Skills measure, are designed for use with college students and adult trainees. Future versions of these existing instruments, as well as new instruments and assessments, will be needed to address the evolving nature of self-regulation across the life span.

Another factor that will have to be addressed in the future is the nature of self-regulation generally across knowledge domains and within individuals across knowledge domains. As Wolters et al. and Kanfer et al. point out, the nature and form of self-regulation can vary across different content domains. As we learn more about the nature of learning, knowledge and expertise in different domains of content and at different levels within a domain, we will also need to expand the nature of assessment of self-regulation.

One other factor needing additional models and methods of assessment is the need for dynamic measures of self-regulation that can generate insights into dimensions of students' real-time on-going use of self-regulation prior to, during, and after task completion. Wolters et al. pointed out the need for dynamic assessment of goal orientation but the problem is more general and covers most aspects of self-regulation.

4. DEVELOPMENT AND ACQUISITION OF SELF-REGULATION

Relatively little is currently known about the development or acquisition of self-regulation and what can be done to facilitate its development or acquisition. Deci et al. address this when they discuss how extrinsically motivated behaviors can become self-determined through internalization and integration over time. Upde-

graff et al. examined the usefulness of their model for predicting math course selection over the span of the high school years. More work needs to be done to examine the development of self-regulation over the life span and how we can impact the development of self-regulation through educational interventions.

In addition, work needs to be done to expand our understanding of the types and roles played by individual differences in these processes. Kanfer et al. provide an extensive discussion of a variety of individual differences and their impact on the development and use of self-regulation. Both Wolters and Updegraff and their colleagues discuss gender differences in the nature and use of self-regulation. Continued work in this area is needed to identify the most salient individual differences that contribute to or inhibit the development and use of self-regulation.

5. CONTEXTUAL EFFECTS AND INTERACTIONS

The study of context effects, particularly in the realm of educational achievement, is experiencing a burst of renewed attention. Further research is needed to deepen our understanding of contextual variables that support, encourage, or discourage the use of self-regulation. The work reported by Deci, Ryan and Williams is a step in this direction. They reported a number of studies that examined the effects of contextual variables, particularly autonomy-supportive learning environments, on both the development and the use of self-regulation. Updegraff et al. examined the interactive effects of a number of context variables on the selection of math courses by male and female high school students. Wolters et al. replicated their design across three different courses.

6. INTERACTIONS WITH KNOWLEDGE, DISCIPLINES AND CONTENT DOMAINS

A related and vibrant area of current research focuses on learning, thinking and the development of expertise in different content areas, disciplines and knowledge domains. More research is needed to examine the interactions among learning and thinking in a content domain, prior knowledge of the student, and dimensions of self-regulation. Another important issue in this area is the degree to which self-regulation strategies and skills are transferable within and across knowledge domains and the tasks associated with learning and performance in these domains.

In the studies reported in this issue, Wolters et al. replicated their results across three different academic content areas: English, math, and social studies. Updegraff et al. examined choice behavior for high school math courses. Both Deci et al. and Kanfer et al. discussed data from both realistic and laboratory-type tasks. Further research is needed to deepen our understanding of self-regulation as it relates to the deveopment and application of expertise in different content domains and disciplines.

7. HELPING STUDENTS TO IMPROVE THEIR SELF-REGULATION

The data discussed in each of the articles in this issue, as well as other research in this area, highlights the importance of self-regulation for learning, making aca-

demic choices and achievement. Self-regulation is a robust psychological phenomenon with applications to settings where individuals select, monitor, and direct their own thoughts and actions. Yet, very few models, guidelines, or curriculum materials have been developed to help students improve their self-regulation. This is a potentially powerful application of the work and findings in self-regulation. For example, we have developed a course in strategic learning at the University of Texas that emphasizes using cognitive learning strategies and study skills, generating and managing motivation and positive beliefs, and self-regulation. This semester-long three-credit course has an enrollment of approximately 1200 students per year, most of whom are either predicted to be at-risk for academic failure or low achievement at the time of their entry to the university or find themselves in academic difficulty at some point during their studies. We conduct extensive pre- and post-testing of the students registered in the course and conduct follow-ups for up to seven semesters. Our data has consistently shown that the course is effective in improving students' grade-point-averages (GPA's), increasing the likelihood that they will qualify for upper- division majors, and increasing retention. The GPA differences compared to students who do not take the course, as well as the general population at the University of Texas, are maintained across semesters.

8. DEVELOPING MATERIALS FOR INSTRUCTION AND TEACHER/TRAINER PROFESSIONAL DEVELOPMENT

In the educational and training spheres, self-regulation is becoming increasingly important as we move toward instructional and learning environments that require greater amounts of self-directed and autonomous learning (e.g., internet courses, hypermedia environments, and distance learning). Additional research and the development of guidelines and models of implementation are needed for diverse educational and training settings, and for the professional development of teachers and professors, tutors, trainers, student affairs specialists, and parents. The impact of the research in self-regulation will be severely limited if we do not make more attempts to communicate with and help all of the stakeholders in education and training settings to understand the nature and value of self-regulation to human functioning in general, and to learning, thinking, and educational achievement, in particular.

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