Role of Faculty in Promoting Lifelong Learning: Characterizing Classroom Environments

Susan M. Lord
University of San Diego
San Diego, CA USA
slord@sandiego.edu

John C. Chen
California Polytechnic State University
San Luis Obispo, CA USA
jchen24@calpoly.edu

Katharyn Nottis, Candice Stefanou, Michael Prince
Bucknell University
Lewisburg, PA USA
knottis@bucknell.edu, cstefano@bucknell.edu, prince@bucknell.edu

Jonathan Stolk
Franklin W. Olin College of Engineering
Needham, MA USA
Jonathan.Stolk@olin.edu

Abstract— **Calls for educational reform emphasize the need for student-centered learning approaches that foster lifelong learning. To be a lifelong learner includes characteristics consistent with those of self-directed learners, such as being curious, motivated, reflective, analytical, persistent, flexible, and independent. Educational research has shown that the building of these aptitudes involves a complex interplay among nearly every aspect of human development. Instructor support of students' self-directed learning (SDL) development relies on understanding and balancing these factors in the classroom. Engineering educators play a critical role in influencing outcomes related to SDL through their design of courses that support students' transitions from controlled to autonomous learning behaviors. This study will examine a variety of engineering courses and pedagogical approaches. Each will be characterized using instructor course information, videotaped classroom observations of instructor-student and student-student interactions, student and instructor responses to surveys, and focus groups. Finally, the students' capacity for SDL will be measured using the Motivated Strategies for Learning Questionnaire. This approach should provide for rich, contextualized descriptions of what instructors and learners do, how instructors and students relate to each other, and how students view their classrooms. This work-in-progress paper will describe our initial work in this multiyear study.**

Keywords-Lifelong learning, Autonomy support, Self-directed learning

I. INTRODUCTION

Calls for educational reform emphasize the need for student-centered learning approaches that aid development of broader skills and attitudes such as a capacity for lifelong learning [1,2,3,4,5]. Engineering educators as well as ABET recognize that students' development of such a capacity is vital for their success in today's global and rapidly changing engineering environment [4,5,6]. However, the current emphasis – particularly in the engineering education community – seems to be on assessing students' lifelong learning abilities, rather than on understanding the relationship between instructor practices and lifelong learning outcomes. To be a lifelong learner includes characteristics consistent with those of self-directed learners, such as being curious, motivated, reflective, analytical, persistent, flexible, and independent.

Designing learning environments and activities that engage students in self-directed learning (SDL) and foster the growth of autonomous individuals, however, is not a simple task. With its introduction of program outcome (i) "a recognition of the need for, and an ability to engage in lifelong learning," as a requirement for all engineering graduates, ABET essentially challenged engineering educators to determine how we may best engage students in SDL (and eventually lifelong learning). To effectively promote SDL, faculty need to be skillful in facilitating pedagogies that engage students in self-direction, be sensitive to and understand student attitudes and behaviors in SDL settings, and be aware of the roles that classroom environments can play in aiding students' SDL development.

The limited existing studies show no significant gains in undergraduate engineering students' capacity for SDL via traditional instruction [7,8]. However, nontraditional instructional practices such as problem-based learning are more explicitly designed to develop student attitudes and skills relevant to SDL, and there is some literature support to suggest that these approaches are more effective at developing self-directed learners [9]. There remains, however, little empirical data on those factors that promote SDL amongst undergraduate engineering students, especially from carefully designed studies using validated instruments. This multiyear investigation seeks to fill that gap by conducting an observational study that examines a range of engineering environments, carefully characterizes instructor practices regarding support of student autonomy, and analyzes the relationship between classroom environments and proxies for lifelong learning such as SDL behaviors and attitudes.

This work is supported by the US National Science Foundation under Grant Nos. EEC-0835884, EEC-0835889, EEC-0835901, and EEC-0835911.

II. BACKGROUND

A. Defining Self-Directed Learning

One of the greatest challenges associated with SDL lies in its definition. Some engineering educators may consider it as a single skill that individuals either have or lack. In reality, the building of SDL aptitude involves a complex interplay among nearly every aspect of human development. Individuals become self-directing through mastery of a broad range of skills, attitudes, and knowledge [10-17]. The education literature includes extensive discussion of the competencies and attitudes of effective self-directed learners [18-21] and descriptions of the many factors that affect student growth in autonomous learning environments. These include cognitive and metacognitive factors [11,22] motivational factors [11,23], behavioral components [24,25] and contextual and social aspects of learning [22,26-30].

Motivational, cognitive, behavioral, and contextual factors are clearly interrelated, and the support of the development of students to become self-directed learners relies on a complex balancing of these factors in the classroom. For example, much is known about the relationship between student self-direction and motivation, and about the importance of fostering positive student attitudes and behaviors for engagement in SDL environments. Autonomy has been shown to increase students' intrinsic motivation, self-efficacy, and perceptions of task value [31-33], and use of cognitive and metacognitive strategies for learning and adaptive motivational strategies [34]. Black and Deci further demonstrated that autonomy-oriented students had higher perceived competence, higher interest and enjoyment, and lower anxiety and grade-focused goals [27]. Zimmerman emphasized that in addition to metacognitive skills, students need a sense of self-efficacy and personal agency for success in self-directed environments [35].

B. Role of Instructor in Self-Directed Learning

Although much of the burden of developing SDL competence falls on students, instructors also play a critical role in effectively promoting individual SDL development both through their instructional choices and their interactions with students. Autonomy support is one such area in which different practices may yield different outcomes. Black and Deci, in their investigation of undergraduate students in organic chemistry, revealed that students' perceived instructor support of autonomy related to improved perceptions of competence, interest and enjoyment, and ability to self-regulate [27]. Opportunities for individual choice, control, authority, and responsibility appear to be important elements in both the academic achievement and the psychological development of students.

Table I, developed by Stefanou et al. [28], provides a framework for characterizing different types of autonomy support that may help develop students' self-directed learning, along with examples of specific instructor strategies. In this framework, Organizational Autonomy Support includes student choices that are primarily related to contextual factors (e.g., selection of team members) and behavioral factors (e.g., managing due dates). Procedural Autonomy Support includes choices related to students' intrinsic motivations (e.g., discussing their wants and displaying individual work), and some opportunities that connect motivational and cognitive strategies (e.g., selection of resources). The Cognitive Autonomy Support describes choices that relate directly to students' mental processes during learning (e.g., self-reflection on errors, consideration of multiple solutions and strategies).

TABLE I. STRATEGIES ASSOCIATED WITH THE DIFFERENT FEATURES OF AUTONOMY SUPPORT

Organizational Autonomy Support	**Procedural Autonomy Support**	**Cognitive Autonomy Support**
Students are given opportunities to: • Choose group members • Choose evaluation procedure • Take responsibility for due dates • Help create class policies	Students are given opportunities to: • Choose how competence is demonstrated • Display individual work • Discuss their wants • Choose resources to use	Students are given opportunities to: • Discuss multiple approaches • Find multiple solutions • Justify solutions • Be independent problem solvers • Reevaluate errors • Debate ideas freely • Have less teacher talk time; more teacher listening

Unfortunately, there is little solid empirical data that shows how instructor choices promote or hinder SDL development in undergraduate engineering students. Of the many factors that contribute to the student response in autonomous learning environments, perhaps the least explored are the contextual or environmental factors. In 2000 Paul R. Pintrich noted that "there is a clear need for more descriptive, ethnographic, and observational research on how different features of the context can shape, facilitate, and constrain self-regulated learning [13]. Nearly a decade later, the need remains. Studies have shown that students' positive perceptions of their assigned tasks and instructors' autonomy support can lead to increases in intrinsic motivation, self-regulation, perceived competence, interest, engagement, and academic performance [34,36,37], but the connections between these student perceptions and the instructors' choices in course design and classroom environments remain unclear.

Clearly, there exists an opportunity for researchers to identify approaches, interventions, interactions, and contexts that promote the development of SDL skills in undergraduate students. In particular, there is a need to provide a deeper understanding of the relationship between the types of student autonomy support and the development of SDL competencies. Our study will aid instructors' understanding of how their classroom practices affect a range of student outcomes related to lifelong learning. We expect that variations in ways that instructors support student autonomy will influence students' development as self-directed learners. We aim to gain a clearer understanding of how aspects of course design and implementation relate to student responses and learning outcomes by exploring these questions:

1. In what ways do engineering instructors assist students to become self-directed learners? Are there instructor practices

and behaviors that lead to greater student involvement in and ownership of their own learning?

2. What are students' behavioral and affective responses to different ways autonomy is supported in undergraduate engineering settings?

3. What effect does a sense of autonomy have on students' perceptions of their own learning?

III. Methodology

A variety of different undergraduate engineering course environments will be examined as part of this study. The courses span nearly all academic levels, include both lecture and laboratory settings, and provide a range of pedagogical strategies that emphasize active, collaborative, problem-based learning, and project-based learning. This study focuses on active learning environments since these have provided the most promising results to date for developing students' capacity for self-directed learning.

Although all of the classroom settings may be characterized as "active," the different courses will present recognizable differences in the types and amounts of student choice and control, as well as differences in the classroom environment characterized in terms of student-student and student-faculty interactions in support of student autonomy. As such, these courses provide an opportunity to study the relationships between differences in autonomy support on the development of SDL-related competencies of motivation, student autonomy, and cognitive and metacognitive strategy use. We anticipate the different courses will provide wide variety in the type and level of organizational, procedural and cognitive student autonomy support. The rigorous characterization of the classroom environment with respect to student autonomy support is the first phase of the evaluation component of this project and is the focus of this paper.

A selection of class sessions for each of the instructors will be studied intensively through the lens of autonomy-supportive practices. To do this, syllabi and classroom artifacts in the form of classroom assignments will be collected, selected class sessions will be videotaped, and the instructors will complete a survey that measures personal epistemology. Students will be asked to complete a survey that measures the aspects of motivation, autonomy, and cognitive and metacognitive strategy use that are associated with SDL at the beginning of the semester and again at the end, and students will be videotaped along with their instructor during preselected class sessions. At the completion of the course, the instructors will be interviewed to discuss the choices they made in their course and students will be interviewed to discuss how those choices affected the variables of interest in this study.

IV. Work in Progress

We are in the first year of this three-year study, and are beginning the process of characterizing our various classroom environments. We will report on preliminary findings at the conference. Here we describe the various courses and characterization methods in this first year.

A. Descriptions of Courses

Heat and Mass Transfer is a required course for third year chemical engineering students. It adopts a problem-based learning structure in which students work in teams to solve a variety of open-ended, relevant engineering problems. Students are provided limited organizational autonomy support (they have some influence of team members and due dates) and more significant procedural autonomy support (they have significant influence on the selection of resources and regular opportunities to discuss their wants). In addition, the course incorporates very substantial cognitive autonomy support elements in that students are engaged in regular discussions of multiple approaches and solutions to problems with heavy course emphasis on justifying their solutions and exhibiting independent problem solving strategies.

Circuits is a sophomore-level course for electrical, industrial and mechanical engineering majors. Faculty-student interactions occur primarily during class lecture periods. In a typical class period, the professor prepares notes in PowerPoint which are projected using a TabletPC. The notes are intended to provide the outline and structure for the discussion of the topic, and there are many spaces where students are encouraged to write in their own notes, answers to questions or solutions to problems. Students are often asked questions to be sure that they are following, and they are called on in order going around the room to be sure that everyone is involved. In short, there is a reasonable amount of faculty-student interaction during these times but little student-student interaction during this time.

Most periods of the Circuits course also include at least one activity for which the problem statement is included in the notes along with whatever supporting information is necessary. Students are told to "turn to a helpful neighbor" and work out their solution. Students then work together on the problems while the professor walks around the room and checks in with groups, asks questions or answers questions. During this time, there is a fair amount of faculty-student interaction and student-student interactions within their groups. Finally, there are significant student-student interactions in cooperative-learning homework teams. Three to four students are assigned to each team at the beginning of the semester and each team meets weekly to work on the week's assignment. Team members rotate through various roles on the team and submit one solution set.

Failure Analysis and Prevention is a project-based, upper-level elective course for engineering students. Student development in the course is focused on professional-level competencies and application of self-directed learning skills. By organizing and carrying out self-directed failure investigations of real-world components and systems, and through analysis of published case studies students learn failure analysis by doing failure analysis. The projects emphasize the interdisciplinary nature of failure investigations, and they provide students with the opportunity to select team members and due dates (organizational autonomy), identify resources and express their own goals (procedural autonomy), and select learning strategies, manage class time, align learning with their own goals, and self-assess their project work as well as their development as a team member and lifelong learner (cognitive autonomy). Throughout the projects, the instructor serves as a consultant and a sounding board for students' experimental strategies and data analyses. Some of the class periods are devoted to open-ended discussions and debates of contextual factors that contribute to engineering decision-making. In the first half of the semester, the instructor provides weekly reading assignments and facilitates an in-class discussion of the readings. In the second half of the semester, student teams take responsibility for the selection of readings and facilitation of the in-class discussions.

The final course under study in the first year, Thermodynamics II, is a required course for mechanical engineering students. The course is taught in a lecture format with homework sets, quizzes, and midterm and final exam. It relies on the least amount of formal team work both in and out of class, and opts instead for peer teams formed *ad hoc* during class meetings. The instructor uses active-learning techniques during class, including the use of clickers and "turn-to-your-neighbor and discuss." Outside of class, students are highly encouraged to work in small groups to complete the assignments, but each student is expected to submit a homework, if he or she elects to do so. In addition to active-learning techniques, the instructor makes available partially completed notes, and incorporates some conceptual questions (using the clickers) to get away from focusing only on calculation-based examples. A typical class includes a brief lecture (less than 10 min) and quickly moves to problem solving. The instructor sets up the problem (describing it, providing known values, etc.) and breaks it into small 'chunks' or steps, which is then turned over to the students to solve individually. The students' understanding is then checked using the clickers. When there is some confusion as to the correct answer, students form impromptu two-person teams to discuss the question, and then are retested using the clickers. This procedure is repeated until the problem is completed, at which point a new problem or topic is begun.

B. Evaluation Methodology

A mixed-method approach will be used to examine how instructors support and facilitate student autonomy and other outcomes associated with SDL, such as motivation and cognitive and metacognitive strategy use. The evaluation plan includes:

- Characterizing the learning environment within the chosen engineering courses with respect to support of student autonomy and authority
- Using surveys to collect data on student outcomes relevant to lifelong learning in the diverse classroom environments
- Conducting focus groups with student to develop a deeper understanding of emergent themes in the student responses to instruction in the different course settings
- Conducting semi-structured, open-ended instructor interviews to develop a deeper understanding of the instructors' rationales for instructional decisions with respect to objectives associated with supporting student outcomes associated with lifelong learning

Each of these elements is described in more detail below, and a summary of the evaluation goals and assessment tools is shown in Table II.

1) Characterizing the Learning Environment

The classroom environment will be characterized according to the rubric developed by Stefanou et al. [28], which breaks student autonomy support into the three categories of organizational, procedural and cognitive autonomy support. This characterization of the classroom environments will use instructor course information (e.g., syllabi and assignment descriptions), videotaped classroom observations of instructor-student interactions, student surveys using the Learning Climate Questionnaire (LCQ) [39] and instructor surveys using the Epistemic Beliefs Inventory (EBI) [38]. In addition, student responses to the LCQ survey, focus groups and student dialogue from the videotaped class sessions will be used to gauge students' perceptions of the degree to which the learning environment supported their sense of autonomy. This approach should provide for the creation of rich, contextualized descriptions of what instructors and learners do, how instructors and students relate to each other, and how students view their classroom environments.

2) Assessment of SDL Outcomes

Students' capacity for SDL, defined in terms of motivation, autonomy, and cognitive and metacognitive strategy use will be measured at the start and end of the term using an available validated survey instrument (MSLQ) [40]. This instrument provides the opportunity to correlate differences in relevant outcomes with specific instructor practices and classroom environments. Multivariate analyses of variance will be used to evaluate the effects of time and the independent environmental variables on the multiple dependent variables such as student cognitive strategy use, self-efficacy, and motivation. Causal model or path analysis will be used to build a model that describes how different instructor approaches lead to different student psychological outcomes. This model development will include determination of the correlations between instructor approach and student outcomes, and between and among the dependent variables. Cronbach's α values will be calculated to determine reliability and temporal stability of the quantitative assessment data. Inter-rater reliability estimates will be calculated to determine the degree of rater agreement on the data coded for autonomy support.

Student focus groups and instructor interviews will be used to develop a deeper understanding of emergent themes in the student responses to varying levels of learning autonomy in the different course settings and instructional decision-making. The design of the formal interview protocol will be guided by the classroom observations and survey results, but possible areas of focus include students' and instructors' goal-setting and planning; student monitoring and self-evaluating of learning; instructors′ environmental structuring; self-view as an autonomous learner and instructor; affective responses to choice and control; internalization of learning goals; time and effort management; active help-seeking; and reflections on learning and behaviors.

TABLE II. OVERVIEW OF PROJECT GOALS AND ASSESSMENT TOOLS

Project Goal	**Assessment data and Evaluation Tools**
Characterize the classroom environment with respect to student autonomy support	• Course information (syllabi and assignments coded for task, procedural or cognitive autonomy support) • Classroom observations (videotaped and analyzed by coding for task, procedural or cognitive autonomy support) • Instructor surveys (Epistemic Beliefs Inventory [38] will be completed and correlations calculated between scores on this instrument and type of autonomy support practiced as determined on the basis of the coded data from videotapes and artifacts) • Student surveys (Learning Climate Questionnaire [39]) • Student statements from videotaped classroom sessions, coded for evidence of statements associated with autonomy beliefs • Instructor interviews recorded and analyzed for reflection on teaching practices that support autonomy • Student focus groups videotaped and analyzed for consistency with observations from videotaped class sessions
Assessment of SDL outcomes	
• Cognitive and metacognitive strategy use	• Student completion of Motivated Strategies for Learning Questionnaire (MSLQ) [40]
• Motivation	• Student completion of MSLQ
• Autonomy	• Student completion of MSLQ
• Behavioral regulatory strategy use	• Student completion of MSLQ

Analyses will involve transcription of all interview data and audio/video recordings; coding of interview transcriptions; and comparison of coded data to frameworks for SDL. Correlation analyses will illuminate the existence and strength of relationships between instruction and a range of outcomes tied to SDL. Based on the proposed assessment tools, we expect to identify correlations between the type and degree of instructor support of student autonomy, authority, and feelings of competence and students' motivation, self-efficacy, self-regulation, perceptions of the environment, and perceptions of lifelong learning competency development.

3) Summary of Evaluation Plan

The mixed qualitative and quantitative approach proposed in this study will enable examination of how the instructors' choices regarding support of student autonomy in courses may affect the classroom climate and ultimately students' development as self-directed learners. The results from the proposed investigation will be a valuable resource for all engineering educators who strive to help their students develop lifelong learning skills and ultimately enable them to be successful in their careers.

ACKNOWLEDGMENT

This material is based upon work supported by the US National Science Foundation under Grant Nos. EEC-0835884, EEC-0835889, EEC-0835901, and EEC-0835911.

REFERENCES

1. American Society for Engineering Education Deans Council and Corporate Roundtable, "The Green Report: Engineering Education for a Changing World" (Washington, D.C.: ASEE, 1994).
2. National Research Council's Board on Engineering Education, "Engineering Education: Designing an Adaptive System" (Washington, D.C.: National Academy Press, 1995).
3. Peden, I.C., E.W. Ernst, and J.W. Prados, "Systemic Engineering Education Reform: An Action Agenda" (Washington, D.C.: National Science Foundation, 1995).
4. The Engineer of 2020: Visions of Engineering in the New Century. (National Academy Press (U.S.), Washington DC, 2004).
5. G. Clough, Educating the Engineer of 2020: Adapting Engineering Education to the New Century. (National Academy of Engineering, Washington, DC, 2005).
6. Criteria for Accrediting Engineering Programs, Accreditation Board for Engineering and Technology Engineering Accreditation Commission (2005). Available at http://www.abet.org/forms.shtml.
7. Litzinger, T., Wise, J., Lee, S., Bjorkund, S. (2003) "Assessing Readiness for Self - directed Learning", Proceedings, ASEE Annual Conference and Exposition, Retrieved from http://www.asee.org/acPapers/2003 - 1429_Final.pdf, 2 July 2003.
8. Fowler, D., Maxwell, D., and Froyd, J., (2003) "Learning Strategy Growth Not What Expected After Two Years through Engineering curriculum", Proceeding, ASEE Annual Conference & Exposition, Retrieved from http://asee.org/acPapers/2003 - 534_Final.pdf, 2 July 2003.
9. Blumberg, B., "Evaluating the Evidence that Problem-Based Learners are Self-Directed Learners: A Review of the Literature, " in D.H. Evensen and C.E. Hmelo, eds., Problem - Based Learning: A Research Perspective on Learning Interactions, Mahwah, NJ: Erlbaum, 2000, pp. 199–226.
10. Skager, R., " Self-Directed Learning and Schooling: Identifying Pertinent Theories and Illustrative Research, " International Review of Education 25, 4 517 - 543 (1979).
11. Pintrich, P. R., and E. V. De Groot, "Motivational and Self-Regulated Learning Components of Classroom Academic Performance, " Journal of Educational Psychology 82 1 33 - 40 (1990).
12. Zimmerman, B. J., and A. Kitsantas, "Developmental phases in self - regulation: Shifting from process goals to outcome goals, " Journal of Educational Psychology 89 29 - 36 (1997).
13. Pintrich, P. R., " The role of goal orientation in self - regulated learning, " In M. Boekaerts, P. R. Pintrich, and M. Zeidner (Eds.), Handbook of Self - Regulation (San Diego, CA: Academic, 2000) 451 - 502.
14. Zimmerman, B. J., "Development of self - regulated learning: Which are the key subprocesses? " Contemporary Educational Psychology 16 307 - 313 (1986).
15. Knowles, M., Self-Directed Learning: A Guide for Learners and Teachers (Chicago: Association Press, Follett Publishing Company, 1975).
16. Zimmerman, B. J., Self-Regulated Learning and Academic Achievement: An Overview, Educational Psychologist 25 1 3 - 17 (1990).
17. Rogers, C. R., Freedom to Learn: A View of What Education Might Become (Columbus, OH: Charles E. Merrill Publishing Company, 1969).
18. Candy, P., Self-Direction for Lifelong Learning: A Comprehensive Guide to Theory and Practice (San Francisco, Cal.: Jossey - Bass, 1991)

19. Hung, W., J. H. Bailey, D. H. Jonassen, “Exploring the Tensions of Problem-Based Learning: Insights from Research.” In D. S. Knowlton and D. C. Sharp (eds.), Problem-Based Learning in the Information Age, New Directions for Teaching and Learning, 95, 13 - 23 (San Francisco: Jossey - Bass, 2003).
20. MacKinnon, M. M. “ CORE Elements of Student Motivation in Problem-Based Learning.” In M. Theall (ed.), Motivation from Within: Approaches for Encouraging Faculty and Students to Excel. New Directions for Teaching and Learning, 78, 49 - 58 (San Francisco: Jossey - Bass, 1999).
21. Knowles, M., Self-Directed Learning: A Guide for Learners and Teachers (Chicago: Association Press, Follett Publishing Company, 1975).
22. Zimmerman, B. J., Attaining Self-Regulation: A Social Cognitive Perspective. In M . Boekaerts, P. R. Pintrich, and M . Zeidner (Eds.), Handbook of Self - Regulation (San Diego, CA: Academic, 2000) 13 - 39.
23. Zimmerman, B. J., A. Bandura, and M. Martinez-Pons, “ Self-Motivation for Academic Attainment: The Role of Self - Efficacy Beliefs and Personal Goal Setting, ” American Educational Research Journal 29 3 663 - 676 (1992).
24. Salomon, G. and D. N. Perkins, “Individual and Social Aspects of Learning,” Review of Research in Education 23 1 - 24 (1998).
25. Patrick, H., and M. J. Middleton, “Turning the Kaleidoscope: What We See When Self - Regulated Learning is Viewed with a Qualitative Lens,” Educational Psychologist 37 1 27 - 39(2002).
26. Pilling - Cormick, J., “Transformative and Self-Directed Learning in Practice,” New Directions for Adult and Continuing Education 74 69 - 77 (1997).
27. Black, A. E., and E. L. Deci, “The Effects of Instructors’ Autonomy Support and Students’ Autonomous Motivation on Learning Organic Chemistry: A Self-Determination Theory Perspective, ” Science Education 84 7 740 - 756 (2000).
28. Stefanou, C. R., K. C. Perencevich, M. DiCintio, and J. C. Turner, “Supporting Autonomy in the Classroom: Ways Teachers Encourage Student Decision Making and Ownersh ip,” Educational Psychologist 39 2 97 - 110 (2004).
29. Assor, A., H. Kaplan, and G. Roth, “Choice is Good, but Relevance is Excellent: Autonomy-enhancing and Suppressing Teacher Behaviours Predicting Students’ Engagement in Schoolwork, ” British Journal of Educational Psychology 72 261 - 278 (2002).
30. Evensen, D. H., J. D. Salisbury-Glennon, and J. Glenn, “A Qualitative Study of Six Medical Students in a Problem-Based Curriculum: Toward a Situated Model of Self-Regulation, Journal of Educational Psychology 93 4 659 - 676 (2001).
31. Ryan, R. M ., and E. L. Deci, “Self-Determination Theory and the Facilitation of Intrinsic M otivation, Social Development, and W ell - Being,” American Psychologist 55 1 68 - 78 (2000).
32. Deci, E. L., and R. M. Ryan, “The “What” and “Why” of Goal Pursuits: Human Needs and the Self - Determination of Behavior, ” Psychological Inquiry 11 4 227 - 268 (2000).
33. Garcia, T., and P. R. Pintrich, “The Effects of Autonomy on Motivation and Performance in the College Classroom, ” Contemporary Educational Psychologist 21 4 477 - 486 (1996).
34. VanderStoep, S. W ., P. R. Pintrich, and A. Fagerlin, “Disciplinary Differences in Self-Regulated Learning in College Students, ” Contemporary Educational Psychology 21 345 - 362 (1996).
35. Zimmerman, B. J., “Self-Regulation Involves More Than Metacognition: A Social Cognitive Perspective,” Educational Psychologist 30 4 217 - 221 (1995).
36. Noels, K. A., R. Clement, and L. G. Pelletier, “Perceptions of Teachers’ Communicative Style and Students’ Intrinsic and Extrinsic Motivation,” The Modern Language Journal 83 (i) 23 - 34 (1999).
37. Kaplan, H., Assor, A., & Roth, G.. Effects of autonomy support and competence support on academic functioning. Paper presented at the 8th Workshop on Achievement and Task Motivation, Moscow, Russia (2002).
38. Schraw, G, Bendixen, L. D., & Dunkle, M. E., Development and validation of the Epistemic Beliefs Inventory. In Hofer, B. K. & Pintrich, P.R. (eds) Personal Epistemology: The psychology of beliefs about knowledge and knowing (Mahwah, New Jersey: Lawrence Erlbaum Associates, 2002)
39. Williams, G. C., & Deci, E. L., Internalization of biopsychosocial values by medical students: A test of self-determination theory. Journal of Personality and Social Psychology 70 767 - 779 (1996).
40. Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J., A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ) (Ann Arbor, MI: National Center for Research to Improve Post - Secondary Teaching, 1991).