Motivating Students – Factors to Consider

Introduction

Learning is like most other tasks in that motivation is required to do your best. Of course, learning can, and does, take place in many ways: from the absence of an instructor/teacher to a structured learning environment with teacher-pupil interactions and relationships. Motivation is a key aspect affecting performance, in all cases. Other aspects are also important, including organization of material, clarity, practice and activities (homework or laboratory exercises), reading, and innate ability. Most instructors plan courses or curricula focusing on content and delivery, without considering student motivation. Instructors must now consider motivational to excel in learning as well as subject matter (Chapman, 2000). Svinicki (2005, p. 1) reiterated the importance of motivation:

"Of the factors that influence student learning, motivation is surely one of the most potent. Teachers can affect student motivation in ways that either facilitate or impede learning."

Brief Review of Theory

Motivation falls into two basic categories: extrinsic and intrinsic. Extrinsic motivation comes from a person's environment. Young children are motivated primarily by parental encouragement but as they grow motivators expand to include the anticipation rewards including praise, grades, money, gifts, or similar incentives. Generally, by the age of 15-17 students begin to think about the future; then their vocational goals, career exploration and preparation become motivators (Karns and Myers-Walls, 1996). These youth begin to set goals based on feeling of personal needs and priorities but are still primarily motivated by external incentives.

Intrinsic motivation, on the other hand, comes from internal sources. Intrinsically motivated students want to learn because they are curious, seek knowledge, are interested in self-improvement, and learning gives them satisfaction. Intrinsically motivated people are more likely to develop the habit of life-long learning than extrinsically motivated people (McKeachie, 1999).

The type and level of student motivation depends upon the task, skill, or subject matter being learned. People often have special interests or hobbies about which they are intrinsically motivated to learn all they can. On the other hand, there are some tasks and skills that few of us would ever be intrinsically motivated to complete (e.g., washing dishes, mowing the lawn). Intrinsically motivated learners enjoy learning and generally have better outcomes. So, the challenge in the classroom is to help students move from fully extrinsic motivations along the continuum to becoming more intrinsically motivated.

Deci et al. (1991) describe the self-determination theory which identifies six distinct levels of motivation. The progression from amotivation (not being motivated) towards intrinsic motivation is called internalization. The levels of motivation can be considered by choices/decisions we see our students make. Deci et al. present a compelling discussion of factors affecting internalization. Self-determination theory focuses on three needs: competence, relatedness, and autonomy (self-determination). These researchers proposed that to move towards intrinsic motivation requires external (instructor, parents, etc.) support in these dimensions of competence, relatedness, and autonomy. . Extrinsic motivations are important and can be effective, but they may not lead towards the goals we set for our students. Internalization takes more effort as it requires a move towards autonomy that the student must make. It cannot be done for them. Deci, et. al. pointed out that self-determined forms of motivation are critical because intrinsically motivated students are more likely to stay in school, achieve conceptual understanding, and be well adjusted.

Motivation is not the only measure of student success, of course. A motivated student without the appropriate cognitive skills will not perform well -- nor will a skilled student who is not motivated. Students need to acquire factual knowledge and basic skills as well as critical thinking skills which will enable them to evaluate new ideas and concepts (Pintrich, 1989). Higher-order learning includes problem solving, critical thinking, synthesis and evaluation, and oral and written expression (Donald, 1999). This requires higher-order skills, which generally requires some intrinsic motivation for the student to excel.

Most motivational models of student achievement do not incorporate cognitive skills or strategies in their models. Almost all motivational models assume that students who have a "positive" motivational orientation (e.g., high efficacy, high task value, adoption of a learning goal, low anxiety, etc.) will try harder and persist longer at a task with a concomitant increase in performance (Pintrich,1989). Pintrich studied the interactive relationships between students' motivation and cognition in the college classroom. He found that students can be skilled in cognitive and self-regulating strategies, but motivational beliefs can influence how these strate-

gies are used for different tasks and that different types of students may benefit from different types of interventions to improve students' active learning and critical thinking. For example, students who are motivated but do not seem to have the cognitive and metacognitive skills might benefit most from self-efficacy or attribution retraining programs; however, students who have the self-regulation skills and confidence but lack the interest or value, might benefit most from interventions that attempt to change the nature of classroom tasks to increase the interest and value of the assignments.

Motivation, therefore, while not the only factor in student learning, plays a major role in determining what students will take from a class. A student's level of motivation can be visualized on a continuum from amotivated to intrinsically motivated. One of our roles as teachers is to help students move along this continuum.

Some Motivation Practical Matters

"It is important to remember that there is a limit to just how much we can actually motivate students. But it is also important not to stop trying because you may find that, just as you become tired and frustrated, whatever pressures have been pulling the student down will eventually ease. And when this happens, they will appreciate the efforts you have made." (Anon, 2004, p. 4)

Students cannot be classified with regard to motivation without context of subject matter. A particular student may be very intrinsically motivated on one topic, but externally or even amotivated regarding another. Motivation involves the intersection of pupil, topic, and instructor. Simply getting instructors and students to recognize this will likely help improve motivation and learning.

Student motivation is a function of several variables (Davis, 1999; Sass, 1989); these might be considered the elite eight:

- Instructor's enthusiasm
- Relevance of the material
- Organization of the course
- Appropriate difficulty of the material
- Active involvement of student
- Variety
- Rapport between teacher and student
- Use of appropriate examples which are understandable and concrete

In plant and animal nutrition, the concept of a most limiting nutrient often surfaces. In some situations, even if all else is optimal (or at least non-limiting), a deficiency of a critical element controls potential. This principle, known as Leibig's Law of the Minumum, is illustrated in Figure 1. With regard to learning and motivation, a similar analogy may apply. A student may have all the necessary requirements to do will in a class (prerequisites, natural abilities, etc.), but fail due to a lack of motivation. Note, however, that the simple law of the minimum does not allow for interactions or compensation factors. For example, it might be true, for some learners in some situations, that relevance of the material (to them) is so high that they are able to compensate for another factor (such as organization

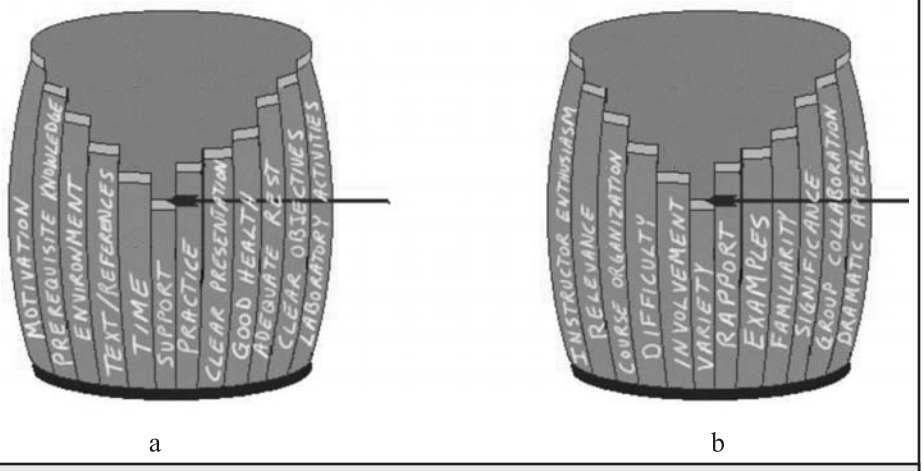

Figure 1. Leibig's law of the minimum applied to (a) learning factors and (b) motivation factors.

of the course) being low.

Chapman (2000) identified several motivation aspects of well-design problems which were similar, yet a bit different than those presented by Davis (1999). These were:

- Familiarity- - some is needed
- Relevance - to current or anticipated future needs
- Dramatic appeal - use real or fictional characters to develop stories
- Significance - making a difference in the world
- Authenticity - actual problems from business and industry are better than hypothetical ones
- Group collaboration - this often helps build enthusiasm

Specific to "significance," assignments which will be used beyond the classroom are particularly motivating. For example, a class taught on Environmental Systems Management combined a wide range of topics. By incorporating a case study approach students were able to see connections between topics and with potential use in their own farming practices. Students reported an increase in effort they put forward and a significant increase in the course rating (from 1.9 to 3.4 on a 5-point scale;

Carroll, 2007). Knowledge that information collected or solutions generated will be used by someone other than the teacher can also be a powerful motivational force. Collaboration as a motivational strategy is reinforced by Panitz (1999) who found cooperative learning to enhance students' self esteem which in turn motivates students to participate in the learning process. Collaboration can be through lab activities, team projects, and presentations.

However, there are assignments that can have negative consequences for students. Chapman (2000) identified several of these factors which detract from student motivation; these were:

• Overly complex problems - which can be overwhelming

• Overly determined problems – because students don't develop problem solving or collaborative skills

• Formal group reports - writing just does not lend itself to group performance

Chapman (2000) suggested that instructors should include assessment tools that seek student feedback on the motivational level of the problems being used. While students may not be in a position (or have adequate context) to judge course goals, learning objectives, and/or materials, they are precisely the ideal group to assess whether a problem, course, or instructor generated interest in the subject matter.

Summary

Motivation is a key aspect of the whole educational process. As an important part of student achievement, some level of motivation is required as a commitment to learning. There are varying levels of motivational "maturity" including amotivated, extrinsic, and intrinsic. Extrinsic motivation can involve several levels of regulation. Getting students involved in the pedagogical aspects by getting them to think about their own motivation can help. Instructors can influence student motivation through their enthusiasm, course organization, inclusion of a variety of relevant examples, involving students, and keeping an appropriate level of difficulty. At times, instructors may not be able to influence student motivation; however, when it can be influenced, the payoff can be tremendous.

References

Anon 2004. Motivating your students. University of Southern California Center for Excellence in Teaching, Module 2.4.

Carroll, N. 2007. Engaging students in environmental systems management. American Society of Agricultural and Biological Engineers. Paper No. 07-8033.

Chapman, D.W. 2000. Designing problems for motivation and engagement in the PBL classroom. Journal on Excellence in College Teaching. 11(2&3):73-82.

Davis, B.G. 1999. Motivating students. In: Tools for Teaching. Jossey-Bass.

Deci, E.L., R.J. Vallerand, L.G. Pelletier, R.M. Ryan. 1991. Motivation and education: the self-determination perspective. Educational Psychologist. 26(3&4):325-346.

Donald, J.G. 1999. Motivation for higher-order learning. New Directions for Teaching and Learning. 78:27-35.

Karns, J. and J.A. Myers-Walls. 1996. Ages and stages of child and youth development, a guide for 4-H leaders. North Central Region Extension Publication No. 292.

McKeachie, J.W. 1999. Teaching tips: Strategies, research and theory for college and university teachers (10th ed.), Boston: Houghton Mifflin Co.

Panitz, T. 1999. Benefits of cooperative learning in relation to student motivation. In: Motivation From Within: Approaches For Encouraging Faculty And Students To Excel. M. Theall, ed. Jose-Bass Publishers, San Francisco. http://home.capecod.net/~tpanitz/tedsarticles/motivation.htm

Pintrich. P.R. 1989. The dynamic interplay of student motivation and cognition in the college classroom, advances in motivation and achievement. Motivation Enhancing Environments, Vol. 6, edited by M. Maehr and C. Ames. JAI Press.

Sass, E.J. 1989. Motivation in the college classroom: What students tell us. Teaching of Psychology. 16(2):86-88.

Svinicki. 2005. Student goal orientation, motivation, and learning. Idea Paper #41. Idea Center. Manhattan, KS.

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A Laboratory Exercise to Demonstrate the Effect of Container Size on Substrate Water & Air Content

Often students have trouble understanding perched water tables and how it relates to the balance between the water-holding capacity and air-filled porosity of soils and soilless growing substrates. This is an especially important concept in horticulture with the use of various sized containers and soilless growing substrates that vary in water-holding capacity and air-filled porosity. Typically shallow containers such as plug trays and seed flats have a higher percentage of saturated substrate than deeper

containers such as six-inch pots or gallon containers. However, many new and young horticulturists do not have a good grasp on how soil-water relations change with container size and thus over-water or under-water crops. Spomer (1974) developed two classroom exercises using sponges to demonstrate the relationship between a free-draining container water content and average height. In his demonstrations the sponge's volume remains constant from the flat to the side to the end positions but the average water content decreases as the average height increases.

These demonstrations are a good way to introduce the topic of soil water distribution but do not show how this can impact plant growth. For example, soil water distribution is very important when considering seed germination. The germination substrate must provide contact between the seeds and the water films surrounding soil particles if the seeds are to germinate. However, too much water can drown a seed or seedling because of a lack of air. Again the concept is a balance between water and air in any substrate that will result in optimum plant growth and performance. To demonstrate the idea of balance between water and air content in substrates, a laboratory exercise was developed to investigate the effects of using columns of different heights on seed germination.

All of the materials for this laboratory were purchased at a local home improvement center. To begin, 10 cm interior diameter polyvinyl chloride pipe (PVC) was cut into pieces measuring 6.5, 9.0, 11.0, 13.5, 21.0, 30.0 and 37.5 cm tall. The bottom of each column was covered with a fine mesh screen and the columns were placed into an adjustable closet flange hub (4"). The columns were filled with washed sand to within 1 cm of the top. It is better to purchase washed sand because it is nearly free of clay, silt and other organic matter. Other substrates may be used, but sand is preferred because it is heavy, provides aeration and has a negligible water holding and cation exchange capacity. Ten seeds of a relatively fast germinating plant were sown on the top of the sand in each column. In past exercises, students have used geranium, tomato, and pea seeds, all of which should germinate in 7 to 10 days. All columns received 400 ml of water daily. Students were asked to record the number of seeds that had germinated after 7 or 10 days in order to calculate percent germination. A seed was considered germinated if the radical had emerged. To demonstrate the effect of container height on germination, students were asked to graph percent germination for each container height. The students were then asked to explain the results as it related to the relationship between container height and substrate water and air content.

Ideally, as column height increases from 6.5 to 13.5 cm, percent germination should increase but decrease as column height continues to increase to 37.5 cm. Students should be able to graph a bell curve. As an explanation students should comment that the average water content decreased as the average height increased and that poor germination in the lower column heights was due to the effects of low aeration due to saturation. Highest germination rates in past exercises using geranium, tomato and pea seeds was always in the 13.5 and 21.0 cm tall containers with the least germination in the 6.5, 9.0, and 37.5 cm tall columns.

In general, the biggest problem associated with this exercise has been inconsistent watering. Students want to give the seeds in the shallow containers less water and the seeds in taller columns more water to compensate. Other problems encountered in the past were some seeds rotted before they germinated and other seeds did not germinate at all. However, these problems can be avoided by careful selection and use of high quality seeds.

Comments from students after seeing the sponge demonstration described by Spomer and collecting data from the column experiment have been positive. Test scores on quizzes and exams also improved after adding the column experiment. One student stated, "I now understand the reason why recommendations will tell you to place some plants in a shallow pot versus a standard pot – it is because that plant needs more water and a shallow pot will have water remaining in the container after it has finished draining."

Reference

Spomer, L.A. 1974. Two classroom exercises demonstrating the pattern of container soil water distribution. HortScience 9(2):152-153

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Globalizing Agricultural Curriculum by Creating International Exchange

In higher education, one of the popular buzzwords of the 21st Century is globalization. Although there are many interpretations of how globalization should be manifested at the collegiate level, the real challenge becomes how to implement it. This is often because many colleges and universities are charting new territory and may not even have the academic structure ready in order to get started. However, by doing a quick personnel skills and experiences inventory, international experience can often be discovered and exploited.

An international exchange between Sam Houston State University (SHSU), Texas, and Palawan State University (PSU), Philippines, has been on-going for over three years. The SHSU/PSU international exchange team recommends the

following checklist of how to get started with the collaboration.

1. Find an institution interested in foreign exchange: networking by both faculty and the college's "International Programs Department" will allow international exchange opportunities to surface. Quite often institutions will match up due to common commodity production, political alliances, customs, or other similarities.

2. Make initial contacts: both institutions need to explore the possibility of establishing an agricultural or related educational exchange agreement; both should inquire about the goals of the other interested institution.

3. Host international guests and visiting foreign colleges and universities: the visitor must have the intention to explore development of an exchange agreement. It is critical to receive administrative support since campus-wide cooperation is imperative and memorandums of understanding (MOU) are executive-level decisions.

4. Develop teaching, research, outreach, and exchange opportunities: even if there is not an agricultural department on both college campuses, exchange opportunities may still exist; collaborative teaching, research, and outreach may still be possible when business and science departments are matched up with agricultural departments.

5. Analyze international faculty and student exchange potential: A college's varied teaching, research, and outreach programs make it difficult to easily assess exchange potential with other higher educational institutions; however, efforts should to be made to discover and develop mutually beneficial opportunities. Exchange opportunities allow faculty and students from both institutions to see another part of the world and gain global experience.

6. Understand educational and cultural similarities and differences: everyone has the same basic needs and wants; however, we filter them through our own personal experiences and environment. Faculty and administrators must visit each others' campuses in order to get sufficient knowledge of both participants' cultures.

7. Find funding for student and faculty exchanges: funding may occur with both traditional and non-traditional sources such as: USAID, USDA, the Rotary Foundation, and other private and public foundations. There are sometimes international components of existing grant programs which will enhance the grant and add to the international exchange.

8. Develop long-term college exchange relationships: long-term relationships are found when all three college functions (teaching, research, and service) are jointly met and participating colleges can each benefit. Negotiation of international curricula offered by exchange partners will help meet each institution's globalization objectives. Constant communications and monitoring of activities are imperative for long-term partnerships.

9. Fully engage faculty, researchers, and students: learning takes place during both one-day and full-semester teaching opportunities. Adding contributions from the colleges' arts (such as music, dance, and other creative media) will create better understanding of cultural similarities and differences. If language differences exist, immersion classes will help overcome existing communication challenges.

10. Evaluate college teaching, research, and service success: since non-traditional benefits result from an international college and/or university exchange, non-traditional assessment methods should be developed and implemented. Qualitative assessment methods may be more appropriate for these situations.

By following the suggestions mentioned above, any institution of higher learning can reap rewards for the institution, its students, and faculty and staff by globalizing and creating international university exchange. To best accomplish this, determine what your institution will gain from globalization and then involve as many persons as possible. The rewards of globalization are many for everyone involved.

Literature Cited

Hamilton, Phil, L. A. Wolfskill, Doug R. Ullrich, Stanley F. Kelley, and Reiko Clark. "Creating international exchange opportunities for undergraduate and graduate agricultural programs." Poster at 23rd Annual International Agricultural and Extension Education [AIAEE], Polson, Montana. May 20-24, 2007.

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