Developments In Business Simulation & Experiential Learning, Volume 24, 1997

THE ENERGY FACTOR: BUILDING MOTIVATION IN THE SIMULATION GAMING ENVIRONMENT

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ABSTRACT

Advocates of simulating gaining pedagogy often cite increased student motivation as one of the most persuasive arguments in favor Of its use. And yet, motivational theory is rarely incorporated as a factor in discussions of gaming design or administration. Does motivational theory have nothing to contribute? This paper uses Lawler's integrative motivational model as a basis for analyzing how motivational theory might be incorporated into game design and administration. It reviews potential contributions of each component of the model and suggests areas for future research.

INTRODUCTION

Imagine students walking into your classroom for the first time without any experience with a simulation game. What is going on in their minds as you discuss the various elements that come into play during the gaining process? How can you challenge the students to enjoy the game and facilitate a dynamic learning experience? What are things that you can do to inspire and motivate the students to facilitate this learning?

Computer simulations are becoming increasingly popular in business school classes. According to Faria and Nulsen (1995), 97.5% of the AACSB schools are using at least one simulation game in their academic program. How are these games being implemented into courses to stimulate learning? Can a computer simulation be an effective means of motivating students to apply a composite knowledge of business into actual business decision-making? How can this simulation stimulate learning?

The basic model is shown in Exhibit I. Note that, in the model, motivation is mediated by the amount of effort a student is willing to put into the learning process. This, in turn, is one of three factors determining the level of student performance. The other two are not insignificant. In fact, they are the focus of most discussions in training in general, and of simulation gaming in particular.

"Ability" represents the degree to which the student is able to make the judgments necessary to interpret what is happening in a game and respond appropriately. "Problem-solving approach" represents the actual techniques the student is using to solve game-related problems. A student may have tremendous ability, but may simply be off on the "wrong track." For instance, a student may develop a series of elaborate spreadsheets to evaluate the various inputs and outcomes of the game giving him the ability to try Out various scenarios and decision alternatives. But, embedded in the spreadsheet model are countless assumptions. It may be that the very complexity of the model is deceiving, hiding assumptions and causing the student to "miss the forest for the trees." The issue would not be one of ability, but merely the approach the student was using. Substituting a simpler set of analytical tools might improve performance dramatically.

Exhibit 1:
How Motivation Relates to Performance

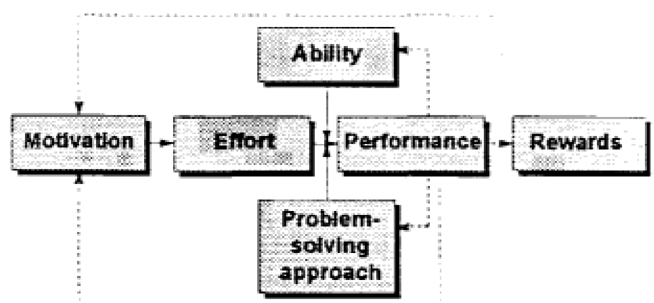


Exhibit I was adapted from a discussion presented by Lawler (1971), in which he sought to develop a comprehensive model of motivation and how it might explain the relationship between pay and performance. The purpose of this paper will parallel Lawler's discussion in that it too focuses on the motivational component of this model, except that it will address the broader range of motivational variables that might be operating in a business simulation game environment.

The paper will begin by a discussion of Loewenstein's "curiosity" model, as proposed by Gentry and Burns (1996), and then it will expand the discussion using the integrative framework proposed by Lawler (1971). While it will focus on the motivational component, it will bring ability and goals into the model only insofar as they interact in a way that affects motivation.

TOWARDS A MODEL OF STUDENT MOTIVATION

One of the major stimuli for this paper was a panel discussion (Gentry, Anderson. Burns. Cannon, Faria, Frazer, Gosenpud, Lawton, Nulsen, Teach, and Wellington 1996) in which Gentry and Burns (1996) proposed Loewenstein's (1994) curiosity model as a basis for understanding the motivational component of simulation gaming. The topic is important because, notwithstanding the general recognition that simulations increase student motivation, there is little discussion of how this might take place. Indeed, the whole topic of motivation to learn has been relatively neglected in the training literature (Clark, Dobbins and Ladd 1993).

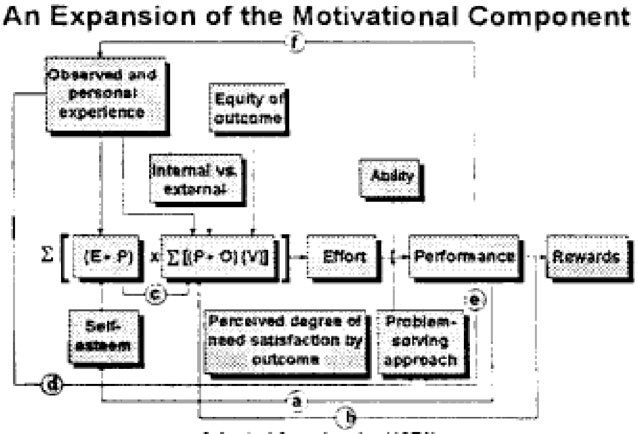
Loewenstein (1994) addresses this problem by proposing an information-gap" perspective, in which curiosity arises when attention is focused on the information gaps in one's knowledge. Consider a student, without previous business classes, starting her first marketing course. The instructor explains the concept of cognitive dissonance in a post-purchase behavior and "the wheels start to turn" in the student's head. A mental gap is formed between a full understanding of cognitive dissonance and what she first understands. As the student focuses on this gap curiosity arises and leads her attention to what she doesn't already know

The information gap "can be defined by two quantities: what one knows and what one wants to know" (Loewenstein. 1994, p. 87). Loewenstein states that closing this informational gap depends on overcoming two characteristics of the information set: (1) incremental (step-by-step understanding) and (2) insight (one flash of inspiration) characteristics. With an insight characteristic, the subject can receive a single piece of information (seen as this flash of inspiration) which solves a given problem and thus decreases curiosity and closes the information gap. In contrast, single pieces of information found incrementally (step-by-step) are unable to close the gap completely because the "information is unlikely to yield a sudden solution" (Loewenstein. 1994, p. 88), For our marketing student learning about cognitive dissonance, a single piece of information (e.g.: the definition of the term cognitive dissonance), might be sufficient enough to close tier information gap and decrease curiosity. However, pieces of information found incrementally (e. g: the definition of the term, some examples of cognitive dissonance from the instructor, and personal experiences) can peak the student's curiosity. Loewenstein states that a subject's attention is more likely to be attracted to the knowledge gap when information about the gap topic increases, giving her both a greater knowledge of what there is to be learned arid a greater expectation that the learning can take place.

Loewenstein also notes that curiosity may not increase with the increase of this knowledge. ln fact, we agree. Furthermore, there may be mans reasons for this. Curiosity is only one of several models that leads to motivation, and it is only one means of stimulating learning. Ideally, we could find a broader model that accommodates the curiosity model, but also explains when it is or is not likely to work.

Lawler (1971) suggests such a model. The basic components are illustrated in Exhibit 2. It suggests that the actual motivation to exert a performance effort is determined by three key variables: (1) the probability of effort leading to performance (E-*P), (2) the probability that performance leads to an outcome (P->O), and (3) the valence (V), or value, the person attaches to the outcome. For instance, it would address Loewenstein's model by asking, "How likely does the student believe it is that he will be able to study effectively, if he were to try?" "How likely is it that study will produce the desired knowledge (satisfy the curiosity)?" And. "How important is it to satisfy the curiosity?" A wrong answer to any of the three questions would cause a breakdown in the model. If the student did not believe he could study effectively, there would be no point in trying. Similarly, if he could study, but he did not believe that study would produce any results that too would kill his motivation. Or finally, if he simply did not place much value on satisfying his curiosity all the successful study effort in the world would be a relative waste of effort.

Exhibit 2:
An Expansion of the Motivational Component



Adapted from Lawler (1971)

There is nothing really profound in this conceptualization. Lawler's model was merely one of several expectancy value models proposed in the 1960's and 70's. Lawler's real contribution was the model's integrative nature. It tied expectancy-value to a broad range of other psychological theories, suggesting how the model might mediate their impact on motivation. In turn it then suggests (Exhibit 1) how motivation might mediate their impact on performance. Finally, it indicates the manner in which feedback loops link outcomes to motivational components thus explaining how students learn from their experience.

This makes the model particularly useful in structuring educational programs.

The Link of Effort to Performance

Consider the student who has completed his final semesters in a business program and is taking a marketing policy course as a capstone to his program. The course has a business simulation component, which is used throughout the semester. While the student has no experience with a simulation, he sees himself as able to perform well based on his general knowledge and background. That is, his subjective probability that effort leads to success (E->P) is relatively high. This factor is generally referred to as *expectancy* in expectancy-value theory.

Exhibit 2 suggests that this probability is influenced by two factors: the subject's self-esteem and the subject's personal experiences in similar and identical situations. If the student has high self-esteem and believes that he can perform well with his simulation production team, this increases his E->P probability. Conversely, if he feels that he has little control of group decisions and has lower self-esteem, this will decrease his E->P probability.

Self-esteem is a generalized feeling of adequacy and competence what Bandura (1982) calls self-efficacy, while personal experience represents a much more objective and situation-specific assessment of one's ability to perform. Both of these are influenced by performance. The student's previous experience with computers with working in-groups, and making decisions will impact most directly on experience, but it may also work through self-esteem. That is it may lead a student to make the relatively objective assessment that she is able to perform adequately in the simulation, but it may also help her reassess her basic technical competence as an individual. It may well be that a relatively minor success in the simulation exercise would come to be a symbol of the student's new, emerging self - a self-image that is no longer limited by a fear of technology.

Implications. The implications for the user of simulation games are profound. The instructor must be able to assess both the perceived level of competence, and the more generalized self-image of each of the students. She must then be able to structure performance feedback that will reinforce the motivational process.

Clearly, people with high self-esteem will be most resilient. They will not question their ability to perform in general but only in the specific context of the game. Their E-*P assessment will revolve around two questions: "Is performance a function of effort, or is performance simply a random outcome?" and "If performance is a function of effort, how much effort will I need to put into this?'

The implications, then, follow directly from the analysis. The instructor has two primary tasks. First, she must convince students that performance in the game is indeed a function of student effort. She can do this both by discussing the principles by which the game operates, and by helping students see the reasons for their success or failure. The instructor generally cannot afford to simply start the game and let the students muddle through on their own.

Second, the instructor must help students frame the simulation experience in such a way that they will value the outcomes of good performance. Note why this is necessary for the perception of effort resulting in performance: A student may well believe he can succeed if he tries, but only if he tries hard enough. Given all the other demands on his time and energy, he may not be willing to invest the necessary resources. This, of course, will lead him to conclude that his effort will NOT result in performance. and so he might not even try reallocating his scarce resources to some other activity where they will produce a greater return. For instance, a student may decide that success in the game will require him to take a leadership role in the team, and that the work will amount to four or five hours per week. Suppose that he only has two hours available. The question is, "Will the two hours give me more return invested in the game or in some other kind of activity (such as studying for exams)?" Depending on the answer, the grade-maximizing student may dramatically decrease involvement in the game.

In contrast with high self-esteem students, low self-esteem students are more likely to see any failure as evidence of their overall incompetence. And, if they are incompetent, how can they expect their efforts to result in positive performance? So, why try?

Here, the key is twofold: First, the instructor should focus attention on problem-solving approach, as suggested by Loop (d). The low self-esteem student is likely to attribute failure to ability rather than learnable skills. The role of the instructor, then, would be to encourage and nurture the student, helping him "deglobalize" and "deemotionalize" any negative results, substituting an analytical learning approach. This follows from the work of Weiner (1986), who argues that people might attribute failure to a lack of ability or a lack of effort. If the problem is lack of ability there is not much to be done. But if the problem is lack of effort, or, as we have suggested failure to use the appropriate problem-solving approach it is easily remedied. The obvious implication is that the instructor should seek to structure students' attributions, helping them to link their success or failure to the amount of effort and problem-solving approach, not their inherent ability. This is suggested by loop (f), where performance feedback helps students see how their efforts do make a difference.

The second key to working with low-image students is to attack the negative self-esteem directly. This is suggested by feedback loop (a). Given the symbolic value of performance in establishing self-esteem, the instructor should seek to structure situations where the student is likely to succeed. This may well mean providing extra help or encouragement providing keys that help the student break through the emotional paralysis often caused by the belief that one is simply unable to succeed.

In practice, most classes have both kinds of students - those with high and those with low self-esteem. And yet the approaches are subtly different for each. The kind of supportive nurturing needed by low self-esteem students is likely to come across as condescending to high self-esteem students, and the kind of hard-hitting, action-oriented feedback needed by high self-esteem students is likely to intimidate students with a low self-esteem, arousing their insecurities by suggesting that the game might be easier for some people than it is for them.

One way to address this problem is to simply acknowledge the presence of both kinds of students: “For some of you the game is really a fun challenge. You are constantly asking yourself 0K what did I do wrong and how do I *fix* it?’ For others of you, it is like judgment day. “Oh no! I can’t do this? Will I ever really be a success?’ Let me assure you that there is no magic in the game. It is simply a matter of learning some simple skills and applying them. If you are one of these folks that is constantly questioning your ability, don’t let yourself do it. Find some people in the class who are not having problems and watch what they do!”

The Link of Performance to Outcomes

The second factor that influences motivation in Lawler’s model is the belief that the outcomes of accomplishing the level of performance will result in a given outcome (P-*O), or what is generally referred to as *instrumentality* in expectancy-value theory. Lawler expresses it as a subjective probability.

The subjective probability of P-*O is influenced by a host of different factors. The first is obvious. It is a function of the subject’s personal experiences in similar and identical situations. For instance, the student’s experience might lead her to look at the course syllabus to find out what criteria are going to be used for grading. Or the student might simply infer them from a genera! knowledge of how instructors grade this type of classroom exercise. Similarly, experience might lead the student to the belief that she will experience other outcomes as well, such as an enjoyable (or unenjoyable) group experience, a personal sense of satisfaction, and so forth.

A second factor influencing perceived instrumentality are one’s beliefs regarding internal control (the subject acts on the world) versus external control (the world acts on the subject). This grows Out of Rotter’s (1966) work on “locus of control.” Conceivably, a student may have a relatively strong belief that his efforts will lead to performance, but simply doubt that performance makes any difference. For instance, lie might be distrustful of the teacher, believing that she grades based on the basis of prejudice, personal liking, or other non-performance-related factors. Some people have a generalized tendency to believe that their behavior has little impact on their destiny, while others have a sense of internal control, believing that their performance will be more likely to lead to positive outcomes (Lefcourt, 1966).

Implications. Instrumentality is often taken for granted in discussions of motivation. But it is not trivial. Certainly, there are a great many students whose lives and social environment have taught them to be victims - telling them that there is simply no justice in the distribution of life’s rewards. This is precisely the issue addressed by internal versus external locus of control. While the instructor has relatively little control over the students’ propensity for skepticism. She can provide ver specific feedback by ensuring that rewards follow performance as suggested by feedback loop (b). While one’s locus of control is generally considered to be a personality characteristic that transcends situations, there some evidence that it may vary with the situation (Phares 1976). suggesting that a good instructor might be able to give students a sense of control in her class, even though they generally believe that rewards are a matter of luck.

The Value of Outcomes

The valence (V), or *value,* in expectancy-value theory is the degree to which any given outcome is influenced by the degree to which outcome is valued by the student. As the model suggests, this is largely determined by the degree to which it is perceived to satisfy the student’s needs. Here one might apply any number of need theories, Most prominent is probably Maslow’ s *hierarchy of needs* (Maslow. 1954). The theory suggests that, as students’ lower-level needs are filled, they will tend to be motivated by higher level needs. Grades are very important for a student who is afraid she will not get a good job without graduating, and who has a similar fear that she might not be able to graduate. Similarly, the student who is worried about getting into the right grad school will likely focus on lower level, extrinsic outcomes such as grades.

recommendations and useful skills. A good student for whom grades are not an issue, or one for whom the monetary and prestige rewards of a leading graduate school are not important is much more likely to be motivated by the higher level outcomes such as curiosity or an intrinsic interest in the material.

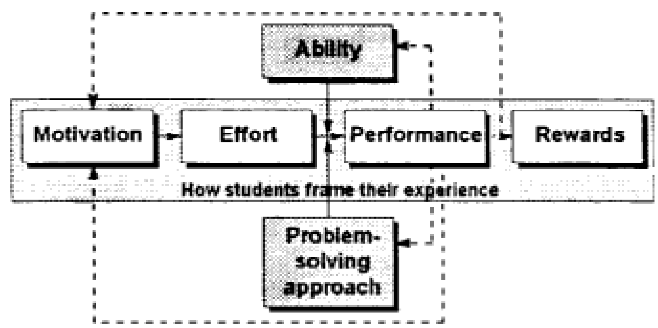
The model suggests that the value of outcomes might also be influenced by the perceived fairness of the input-outcome balance. For instance, if they perceive the exercise as being too easy, where mediocre performance yields attractive outcomes, they may discount the value of the outcomes. This is consistent with Adams' equity theory. If the student works diligently with his portion of the simulation, while a team member is slowing the process down through absenteeism, procrastination, or contributions of lower or poorer quality, there is perceived overpayment. Perceived overpayment (a lazy student getting the same grade than as more achieving students) can lead to a decrease in the valence of grades for the achieving student on the production team.

In Lawler's model E-*P and P-*O represent subjective probabilities, ranging from 1 (effort will lead to performance and performance will lead to outcome) to 0 (effort will not lead to performance and performance will not lead to outcome). The valence of the P-*O ranges from +1 (very desirable outcome) to -1 (very undesirable outcome). These two factors: the subject's belief that effort can be converted into performance (E-*P), and the attractiveness of the events that the subject feels will come from good performance [(P-*O)(V)] combine multiplicatively.

It would seem that motivation should be greatest in cases when the E-*P probability is high. However, the classic studies by Atkinson (1964) and McClelland (1961) have shown that this is not necessarily true. Under some conditions, the highest motivation may result when there is only a *.5* chance of effort leading to performance. This observation complements Loewenstein's (1994) model of curiosity and intrinsic rewards with motivation. If the student feels that his efforts will surely lead to a successful performance, the information gap is closed and the motivation or drive to follow through may decrease. However, if the student gives himself sufficient room for improvement and exerts sufficient effort to maintain this "information gap." the resulting curiosity will lead to higher motivation, as the studies have suggested. These intrinsic rewards (a sense of accomplishment, academic growth. and an increase in decision making ability) "are seen to result from successful performance when there is less than perfect relationship between effort and performance" (Lawler, 1971, p. 111). Motivation, the overall value of (E->P) multiplied by [(P-->0)(V)] may actually be higher when the E->P value is not perfect (1). This is because any value higher than *.5* will decrease the intrinsic value of the outcomes, as suggested by (c).

As a final note regarding the value of outcomes, we should recognize the fact that these are highly dependent on the goals students are pursuing in the context of the class environment. These, in turn, can vary dramatically, depending on the way the students frame the class, the role they see themselves playing. While Lawler does not address this issue, it is certainly consistent with his model, as suggested by Exhibit 3.

Exhibit 3:
Framing the Educational Experience



Consider a student who sees herself training for her first job will likely value specific skills that will help her in the context of her first job. By contrast, if she sees herself as a "liberal arts" student, for whom business courses are an exciting way of building a broad base of life skills, attitudes, and knowledge, she is likely to value a much broader range of outcomes. Most people have any number of different roles that they play in an educational context, any number of different ways that they can frame a class. These generally include both "vocational" and "liberal arts" frames. They also include "good student" and "bad student" roles, where the value they place on high levels of performance might vary dramatically, as would the intrinsic value derived from success.

Implications. The most obvious implication of the valence analysis is that an instructor would do well to be in touch with what students really want out of a simulation exercise. We say this from a motivational, not a pedagogical perspective. The instructor may well have pedagogical objectives that students will not like, that are perhaps even painful. However, the model suggests that student motivation will depend on the value student's place on the simulation outcome.

The pedagogical and motivational perspectives are not necessarily inconsistent. Indeed, students generally choose to take a course, however indirectly. That is, even if the course is required as part of their curriculum, they still chose to enroll in the curriculum. The instructor's job, then, is to link course outcomes to those that motivated initial enrollment. These may well be career-related - to get a job. In this case, the instructor should help students recognize the importance of simulation outcomes in the job-getting process. Of course, these would include business skills and attitudes, but they can also include cruder links, such as the fact that potential employers pay special attention to the grade students get in the class because of their respect for the instructor or for the nature of the course.

In practice, the intrinsic value of the game represented by (c) in Exhibit 2, tends to be a major strength of the simulation approach to education. Students often find the challenge of simulations to be intrinsically exciting. The instructor can maximize this impact by managing the game so that it is neither too easy nor too challenging. When students get lost and discouraged, she can coach them to the next milestone. Conversely, if the game becomes too formulaic most games will allow her to insert special problems or events to which students must respond to succeed.

Note that value of intrinsic rewards are strongly influenced by the way students frame the class. Imagine a student who is about to graduate and frames the course as a final hurdle to be overcome prior to moving on with life. Grade outcomes are not likely to be important, because they will not show up on a transcript in time to influence any potential job interviews, as long as the student passes. But success in the simulation is not likely to have any intrinsic value either, no matter how well the instructor manages the level of challenge. The simulation is simply a requirement to be met with the least possible expenditure of time and effort.

The same student might well be persuaded to frame the class very differently. Rather than a hurdle, it might become a final chance to test the knowledge and skills gained prior to graduation. a place where grades not longer count except as an index of performance quality. It is a place to match wits with the other students in the program to find out who is really most ready to face the world of business.

The implications, of course, are that instructors should help students frame their courses in the most positive manner possible. While the frame might well depend on the objectives of the course, a broader frame potentially opens students up to a much broader range of valued outcomes. The liberal arts" frame enables an instructor to push general problem-solving abilities, social skills, ethical issues, and an enhanced ability to work under pressure. While these are clearly useful in a job situation, they might not be critical in the context of a student's first job.

More important, the instructor should seek to put students to frame the class as an exciting and important educational experience, independent of its role in the curriculum. This way, it will not fall prey to the shallow instrumentality of uninterested graduating seniors, or other students who are hoping to slide by and still get a job when they graduate.

Here the nature of the class, and more directly, the team, in which a student plays the game, can be critical. The intrinsic motivation of a challenge tends to vary with students' level of aspiration (Atkinson 1964), and this tends to be influenced by group norms (Weiner 1992). While the instructor generally has little control over the composition of a class, she certainly can control the structure of student teams. Furthermore, she may also be able to develop strategies for influencing group norms, thus creating pressure for students to adopt a more positive, achievement-oriented frame of mind.

SUMMARY AND CONCLUSIONS

The purpose of this paper was to present an integrative model, describing how motivation relates to performance in a business simulation game environment. The basic model is summarized in the exhibits. Exhibit 1 describes its most basic form, while Exhibit 2 elaborates the detailed components of the model Exhibit 3 shows how framing can dramatically change the motivational structure of the model, even when the external characteristics of the situation have not changed.

From a practical perspective, the payoff comes in the implications. Following our discussion of each major components of the model, we have discussed the implications it might have for the instructor using business simulations.

Our purpose here will be to summarize the implications suggesting a practical method for incorporating them into simulation game design. This is in the form of a simple motivational audit (Exhibit 4). When an instructor is designing her course, she can audit the course plan to ensure that it addresses appropriate motivational issues. Similarly, at various points within the course, she might repeat the audit to ensure that the actual execution of the courses are being executed in a motivationally appropriate manner.

We expect that if the audit procedure is actively pursued, it will become a kind of action research. That is, it will not only provide useful information, it will impact directly on the way the course is being taught simulating the instructor to automatic corrections in order to keep the course on an appropriate motivational track. It should also serve as a stimulus for long-term research in simulation design, guiding game developers to create innovations that will have more motivational impact. Following the logic of Exhibit 1, this, in turn, should stimulate more effective learning tools.

Exhibit 4:

A Simple Motivational Audit

- ☐ Have you convinced students that performance in the game is a function of their effort?
- ☐ Have you helped students to frame the simulation experience in such a way that they will value the outcomes of good performance?
- ☐ Have you encouraged and nurtured low self-esteem students, helping them to "deglobalize" and "deemotionalize" any negative results? Have you substituted an analytical learning approach?
- ☐ Have you sought to structure situations where the low self-esteem student is likely to succeed?
- ☐ Have you acknowledged and addressed the presence of low self-esteem and high self-esteem students?
- ☐ Have you ensured that rewards follow performance?
- ☐ Have you helped your students to link their success or failure to the amount of effort and problem-solving approach, not to their inherent ability?
- ☐ Have you linked course and simulation outcomes to what students really want?
- ☐ Have you maximized the impact of the game by making it neither too easy nor too challenging?
- ☐ Have you helped students to frame their courses in the most positive manner possible?

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