Creating an Interactive Science Murder Mystery Game: The Optimal Experience of Flow

Interface

Index Terms*—*Autotelism, flow, murder mystery game, negentropy, teleonemy, science writing.

—Feature by
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M. Csikszentmihalyi, "The Flow Experience and Its Significance for Human Psychology," in *Optimal Experience: Psychological Studies of Flow in Consciousness*, M. Csikszentmihalyi and I. S. Csikszentmihalyi, Eds. New York: Cambridge Univ. Press, 1988, pp. 15–35.

Traditional in-class writing assignments often fail to engage students effectively. This problem may be compounded when students are forced into group projects, where a student may rightly feel that he or she could complete the entire assignment more effectively alone than the whole group could working together.

In an attempt to alleviate these concerns, I assigned my university science writing class—half Professional Writing majors, half science majors and minors—the creation of an interactive, electronic murder mystery game. The students used PowerPoint to create linked slides in which the clues and cause of death were scientific information. While working on this assignment in class, a number of students forgot the time and kept working long after class was over. Several students reported losing track of time and place when working on the game at home.

These students very possibly experienced a peak psychological state called "flow." FLOW is a phenomenon of human consciousness first brought to public attention by psychologist Mihaly Csikszentmihalyi in *Optimal Experience: Psychological Studies of Flow in Consciousness* [1]. In brief, flow means an exhilarating experience in which the doer's entire attention is so fully concentrated on the task at hand that other life issues temporarily lose meaning. The exhilaration is possible only when the doer is interested in the task and when the necessary skills are evenly matched to the difficulty of the task.

This article begins with a description of the assignment. Next comes a discussion of the theoretical bases of flow, followed by a review of the conditions required for flow to occur.

THE ASSIGNMENT

The inspiration for the mystery game assignment was a newspaper article regarding a nurse who had almost died of latex allergies [2]. I determined that concentrating on latex allergies would provide continuity from group to group, as well as enough subsidiary topics that each student could become a specialist on an aspect of allergies or related topics. Another attractive and useful aspect of latex allergies is that they can become a cause of death by murder, e.g., someone puts a certain allergen in the victim's food; accident, e.g., the victim is unaware that a particular substance is an allergen and ingests, inhales, or touches the substance; or suicide, e.g., the victim deliberately ingests the allergen.

After dividing the class into small groups of four or five, I charged the entire class with certain game requirements. Each student selected a character/murder suspect from a list I supplied and "became" that character. Each student created one "character" slide and a minimum

of five illustrated scientific data slides that could realistically be associated with that character. Each science slide contained a mini-essay on a scientific topic, as well as working links to related slides.

The victim did not have to be a nurse. Students could choose any career or life role for the victim. For the suspects, I suggested a pharmacist, a pathologist, a romantic partner, a rival for the romantic partner, a childhood friend, and a parent or grandparent. Each of these characters would naturally have a particular kind of knowledge of the victim's allergy. For instance, the parent might know of childhood spina bifida, a condition associated with latex allergies. A spouse or best friend would know of some food allergies, for instance, bananas. That person, as well as the victim herself or himself might or might not be aware of other foods associated with latex allergies, for instance, avocados and pears, or of the culpability of certain plants, such as the common houseplant ficus benjamina.

Students were graded individually on their six slides. Students were also graded as a group on the successful linking of the entire body of slides, the visual cohesiveness of all slides, and the creation of certain game slides, including game rules.

Certain skills that the students learned while creating the game are adaptable to the creation of webpages: visual cohesiveness, emphasis on compressed writing and pertinent illustrations, as well as electronic linking. For these reasons, the game assignment offered more than an exercise in science writing and research and the design of PowerPoint slides.

Additional aspects of the game are discussed later in this article.

THE THEORETICAL UNDERPINNINGS OF FLOW

Although most of the research on flow began appearing in the 1970s, the notion of flow was anticipated by Aristotle. The "Aristotelian Principle" culled from Aristotle's *The Nichomachaen Ethics* [3] by present-day American philosopher John Rawls states that

> *other things equal, human beings enjoy the exercise of their realized capacities (their innate or trained abilities), and this enjoyment increases the more the capacity is realized, or the greater its complexity. The intuitive idea here is that human beings take more pleasure in doing something as they become more proficient at it, and of two activities they do equally well, they prefer the one calling on a larger repertoire of more intricate and subtle discriminations* [4, p. 426].

The Aristotelian Principle indicates several of the key aspects of flow: enjoyment, skill, task, and increasingly higher levels of skill and task.

Although none of the flow researchers mentioned here pay homage to Aristotle, the Aristotelian Principle is so closely related to the notion of flow as to be inextricable in my mind. Therefore, I invite you to recall that principle as I review the characteristics of flow and their relationship to the science murder mystery assignment.

Three additional principles are pertinent to this discussion. First is AUTOTELISM. For my discussion of students creating the science murder mystery game, the term means a task worth doing for its own sake and individuals who can identify and find pleasure in challenges that match their skills [1, pp. 29, 31–32]. Second is NEGENTROPY, or the ability of an activity to contribute to increasingly higher levels of a person's development [1, p. 29]. Third is the TELEONOMY of the self, goal orientation that influences the types of activities people choose to perform in order to have more flow experiences. These activities, in turn, aid self-actualization [1, p. 24].

The next section of this article reviews the conditions that produce flow. After presenting each condition, I apply it to the experiences of my students. Finally, I suggest that understanding flow may help instructors create successful course assignments.

The Task In order for an optimal or flow experience to occur, certain conditions must be met. Some of these conditions have to do with the activity or task. Some have to do with the person performing the task.

The nature of a task can influence the doers' likelihood of experiencing flow while performing the task. For teenagers, "games and sports" are particularly likely to offer flow experiences [5, p. 346]. For some adults, complex and/or risk-taking activities provide opportunities for flow: surgery, chess, and rock-climbing [1]. As discussed in the following, a game assignment for adult learners can also stimulate flow.

In addition to the nature of the activity, three other qualities must be present if the activity is to present the chance of flow: clear structure, clear goals, and rapid feedback.

Structure: An activity is most likely to stimulate flow if it is "clearly structured" and if the "level of challenges and skills can be varied and controlled." Such activities include "ritual events, games, sports, or art performances. . . . [or] state-of-the-art" surgery [1, pp. 30–31].

The mystery game assignment began as an outline and list of suggestions I provided to small teams of game creators. I also provided an understanding

of the key characteristics of a crime suspect: a means of committing the crime, a motive for committing the crime, and an opportunity for committing the crime. The assignment evolved into a complicated structure made clear by the students when they developed the mystery story and added scientific clues. The game components that I required included a welcome slide, a credits slide, playing instructions, brief biographies of the characters, story slides that examined the characters and their connections to the victim by way of scientific data, and a final slide that contained the solution to the mystery. The most energetic team produced 87 slides. Less ambitious teams produced 30–40 slides.

In creating a structure as elaborate as they chose, the teams embraced their own "active involvement in the learning process," one of the hallmarks of adult learners [6, p. 9]. Moreover, the teams relished the ability to tell stories, which are acknowledged to have "a sort of learning adhesive that makes it stick to previous learning and experience" of adults [7, p. 34].

Goals and Feedback: Two additional requisites of a flow-producing activity are "relatively clear goals and ... rather quick and unambiguous feedback" [1, p. 32]. The science game assignment provided these requisites. The goal was to create an interactive mystery game that could sustain a player's interest while teaching the player certain scientific information.

Feedback came quickly as teams negotiated the inclusion of various characters; examined the logic of motives, means, and opportunities to commit the crime; and realized instantaneously whether electronic links worked.

In providing immediate feedback, the game assignment (and the game) also provided "signposts" important for encouraging students to participate in a learning situation [8, p. 58].

The Person Some people seek challenge and others avoid it. Those who regularly seek it have probably experienced a psychic "high" (flow) from the activities they performed in order to meet their challenge. Researchers who have documented flow address the reasons only certain people experience that state and only under certain conditions.

Balance of Challenge and Skills: Csikszentmihalyi evaluated flow experiences reported by informants from various professions and cultures. He concluded that "the universal precondition for flow is that a person should perceive that there is something for him or her to do, and that he or she is capable of doing it. ... a balance between the challenges perceived in a given situation and the skills a person brings to it" [1, p. 30].

In class, students expect assignments to do more than satisfy that balance. They want to capitalize on current skills and to learn new skills.

For instance, appropriately prepared students arrived at the game assignment confident of their basic writing skills. Shortcomings in grammar did not distract these students from creating the game. Instead, they plunged into the assignment. They picked up knowledge—scientific information, as well as elements of mysteries and of crime; technical abilities—the linking feature of PowerPoint; and strategies—analysis, logic, and storytelling techniques that included misdirection, concealment, and revelation. Every additional bit of knowledge and skill emboldened these students to increase the complexity of their game each time they revised it.

The science murder mystery game evolved as the students evolved. For some students, the activity and their ability to perform it meshed at what researchers Fausto Massimini and Massimo Carli christened "Channel 2," the conjunction of "high challenge" and "high skill" that equals flow [9, pp. 270–271]. The students who lost track of time and place while working on the assignment very possibly occupied Channel 2.

Massimini and Carli identified seven additional "channels" that define combinations of "perceived skill" and "perceived challenge." One student claimed to have science skills that exceeded the challenge provided by the assignment. In regard to flow, that student probably experienced "boredom" (Channel 4) [9, pp. 270–271]. One way to handle such a student in the future would be to give an additional assignment, for instance, the compiling of an extensive, annotated bibliography on the game's topic. Otherwise, the instructor could also recall that a personality unwilling to find the challenge inherent in an assignment, i.e., autotelism, may also be a personality incapable of experiencing flow. Moreover, the course syllabus stated specifically that the purpose of the course was to produce documents—a brochure, a magazine article, and the game—appropriate for lay audiences rather than other scientists.

If my students' skills had been too underdeveloped to meet the challenge of creating an electronic science game, the students would have exhibited "anxiety" (Channel 8) [9, pp. 270–271]. No one in my classes openly exhibited anxiety.

Personality: Csikszentmihalyi describes as essential to the experience of flow individuals with the autotelic ability "to recognize challenges at a level commensurate with their skill, where others only see tiresome obstacles" [1, p. 32]. He based his comments on Jeanne Nakamura's study of mathematically gifted

high school students. Some of the students blossomed when presented with challenging work. Others underachieved, displaying anxiety and avoiding the level of time and effort put into school work by the higher achievers. The factor that separated the two groups was the willingness of the successful students to work inside and outside of class "for the development of their intellectual potential—they experienced flow" [10, p. 326]. The achievers often placed themselves "in the high challenges–high skills quadrant associated with flow" [10, p. 325].

In my science writing class, certain students performed better than others. The ones who reported losing track of time when working on the assignment outside of class also worked hard in class. They set themselves up to find rewards in the work for its own sake. Although they may originally have had a high grade as their goal, that may not have provided enough motivation to sustain their interest at the levels they displayed. I believe that the experience of flow—an aspect of activities that can be tapped into by certain people—is what kept the better performing students interested in the assignment. Since flow is experienced subliminally as one performs a task, and since flow is pleasurable, the person who experiences flow performs the task for its own, pleasurable sake. As Csikszentmihalyi said, "The mountaineer does not climb in order to reach the top of the mountain, but tries to reach the summit in order to climb" [1, p. 33].

Attention: To be caught up in a task, doers must concentrate fully on that task [1, p. 32]. In a study of attention [5 (p. 342)], Csikszentmihalyi determined further that "optimal experiences are made possible by an unusually intense concentration of attention on a limited stimulus field. ... in such a state the rest of the world is cut off, shut off, forgotten."

Small groups of students in the science writing class displayed such intense focus while discussing ways that several mystery characters could be made to seem guilty of the murder. For instance, suppose the female victim's girlfriend were a pharmacist. As a pharmacist, the girlfriend would have access to drugs: a means of committing murder and a way to introduce the topic of pharmacology. Suppose that the pharmacist were having an affair with the victim's husband: a motive for murder. Suppose that the victim had her prescriptions filled at the pharmacist's store: an opportunity for murder and an opportunity to develop game slides regarding the properties of drugs and the specifics of the victim's ailments.

The discussion of love affairs, drugs, ailments, and pharmacology engaged the students' full attention.

Sense of Time: Csikszentmihalyi summarizes the time-warp experience of his flow informants, such as surgeons, rock climbers, and chess players, as "a 'distorted' sense of time. ... The clock no longer serves as a good analog of the temporal quality of experience" [1, p. 33].

While working on the game assignment, students who experienced flow operated in "psychological time," which expands when "we are busy and alert," rather than in "clock time," which may seem interminable "when we are bored" [11, p. 127].

CONCLUSION

The attractive and beneficial qualities of flow make that state worthy of an instructor's highest regard. We cannot enforce or guarantee flow, but we certainly can provide course assignments structured to offer the possibility of flow to those with the necessary skills and autotelic motivation. Because games are so likely to offer negentropic opportunities for self-expansion, the use of games as course assignments is worth consideration. Students who are goal-oriented practitioners of the "teleonomy of the self" may find in games that combination of enjoyment, task, and skill described by Aristotle.

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