FLOW: A FRAMEWORK FOR DISCUSSING TEACHING

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In this paper I explore Mihály Csíkszentmihályi's notion of flow as a lens to analyse the teaching practices of two very different teachers. Results indicate that flow is not only a good theoretical framework for drawing attention to the differences in teaching style, but also for describing these differences in ways that is grounded in what we know about good learning. The possibility of shifting flow from a descriptive framework to a prescriptive one is also explored.

FLOW AND THE OPTIMAL EXPERIENCE

In the early 1970's Mihály Csíkszentmihályi became interested in studying, what he referred to as, the *optimal experience* (1998, 1996, 1990),

> "a state in which people are so involved in an activity that nothing else seems to matter; the experience is so enjoyable that people will continue to do it even at great cost, for the sheer sake of doing it." (Csíkszentmihályi, 1990, p.4)

The optimal experience is something we are all familiar with. It is that moment where we are so focused and so absorbed in an activity that we lose all track of time, we are un-distractible, and we are consumed by the enjoyment of the activity. As educators we have glimpses of this in our teaching and value it when we see it.

Csíkszentmihályi, in his pursuit to understand the optimal experience, studied this phenomenon across a wide and diverse set of contexts (1998, 1996, 1990). In particular, he looked at the phenomenon among musicians, artists, mathematicians, scientists, and athletes. Out of this research emerged a set of elements common to every such experience (Csíkszentmihályi, 1990):

1. There are clear goals every step of the way.
2. There is immediate feedback to one's actions.
3. There is a balance between challenges and skills.
4. Action and awareness are merged.
5. Distractions are excluded from consciousness.
6. There is no worry of failure.
7. Self-consciousness disappears.
8. The sense of time becomes distorted.
9. The activity becomes an end in itself.

The last six elements on this list are characteristics of the internal experience of the doer. That is, in describing an optimal experience a doer would claim that their sense of time had become distorted, that they were not easily distracted, and that they were not worried about failure. They would also describe a state in which their awareness of their actions faded from their attention and, as such, they were not self-conscious about what they were doing. Finally, they would say that the value in the process was in the doing – that the activity becomes an end in itself.

In contrast, the first three elements on this list can be seen as characteristics external to the doer, existing in the environment of the activity, and crucial to occasioning of the optimal experience. The doer must be in an environment wherein there are clear goals, immediate feedback, and there is a balance between the challenge of the activity and the abilities of the doer.

This balance between challenge and ability is central to Csíkszentmihályi's (1998, 1996, 1990) analysis of the optimal experience and comes into sharp focus when we consider the consequences of having an imbalance in this system. For example, if the challenge of the activity far exceeds a person's ability they are likely to experience a feeling of anxiety or frustration. Conversely, if their ability far exceeds the challenge offered by the activity they are apt to become bored. When there is a balance in this system a state of, what Csíkszentmihályi refers to as, *flow* is created (see fig. 1). Flow is, in brief, the term Csíkszentmihályi used to encapsulate the essence of optimal experience and the nine aforementioned elements into a single emotional-cognitive construct.

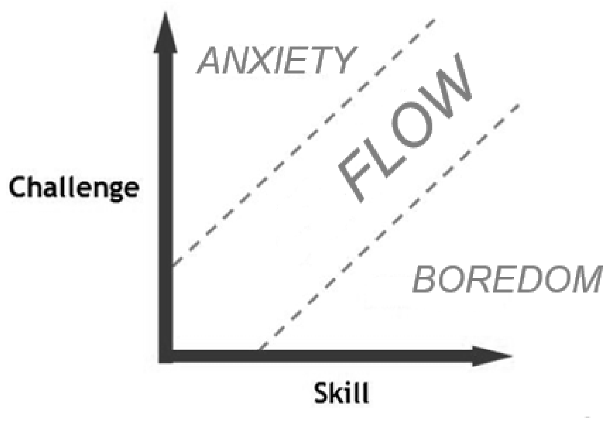

Figure 1: Graphical representation of the balance between challenge and skill

FLOW IN MATHEMATICS EDUCATION

Flow is one of the only ways for us, as mathematics education researchers, to talk productively about the phenomenon of engagement. The nine aforementioned elements of flow gives us not only a vocabulary for talking about aspects of the subjective personal experience of engagement, but it also gives us a way to think about the potential environments that occasion engagement in our classrooms.

Williams (2001) used Csíkszentmihályi's idea of flow and applied it to a specific instance of problem solving that she refers to as discovered complexity. Discovered complexity is a state that occurs when a problem solver, or a group of problem solvers, encounter complexities that were not evident at the onset of the task and are within their zone of proximal development (Vygotsky, 1978). This occurs when the solver(s) "spontaneously formulate a question (intellectual challenge) that is resolved as they work with unfamiliar mathematical ideas" (p. 378). Such an encounter will capture, and hold, the engagement of the problem solver(s) in a way that satisfies the conditions of flow. What Williams' framework describes is the deep engagement that is sometimes observed in students working on a problem solving task during a single problem solving session.

Extending this work, I used the notion of flow to look at situations of engagement extended over several days or weeks wherein students return to the same task, again and again, until a problem is solved (Liljedahl, 2006). The results of this work showed that although flow was present in each of the discrete problem solving encounters, what allowed the engagement to sustain itself across multiple encounters was a series of minor discoveries in each session linking together to form what I referred to as a *chain of discovery*.

FLOW AS A FRAMEWORK FOR DESCRIBING TEACHING

Thinking about flow as existing in that balance between skill and challenge, as represented in figure 1, obfuscates the fact that this is not a static relationship. Flow is not the range of fixed ability-challenge pairings wherein the difference between skill and challenge are within some tolerance. Flow is, in fact, a dynamic process. As a doer engages in an activity their skills will, invariably, improve. In order for the doer to stay in flow the challenge of the task must similarly increase (see fig. 2).

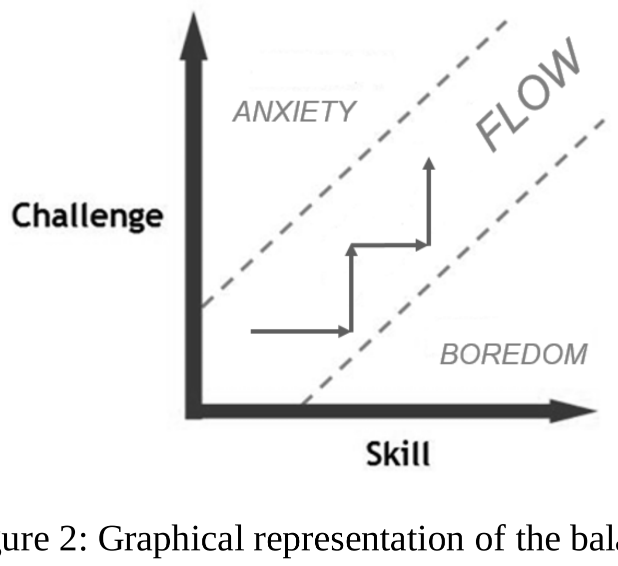

Figure 2: Graphical representation of the balance between challenge and skill as a dynamic process

If the doer is then a student in a learning setting, such as a mathematics classroom, it is up to the teacher to manage the increases in challenge as the student's skill increases.

There is a chance then, however, that the student's skill will increase either too quickly or too covertly for the teacher to notice resulting in a student previously in flow slipping into a state of boredom (see fig. 3). Likewise, there is also chance that when the teacher does increase the challenge that increase will be too great for the student to stay in flow, causing them to enter into a state of anxiety (see fig. 4).

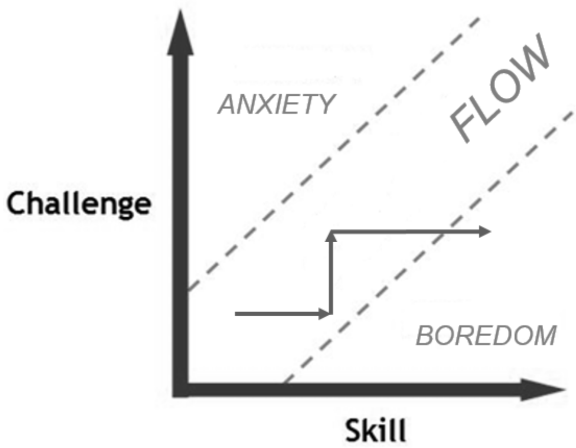

Figure 3: Too fast an increase in skill

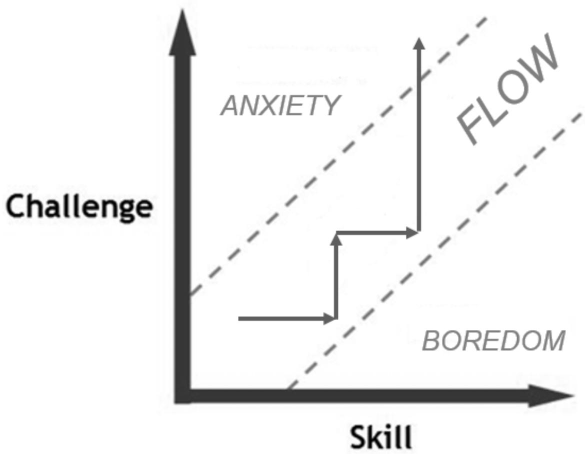

Figure 4: Too great an increase in challenge

In this study, I look at the practices of two teachers through the lens of flow in general and their ability to set clear goals, provide instant feedback, and maintain a balance between challenge and skill in particular.

METHODOLOGY

The participants in this study were selected through purposive sampling. I was looking to compare two very different teaching styles and thus asked a number of school administrators to recommend to me high school mathematics teachers they believed to be effective mathematics teachers and they believed to be confident in their practice. Through this process a pool of 15 teachers were recommended to me. Of these 15 teachers, six agreed to have one of their 'typical' mathematics lessons filmed. Each of these videos was produced using a camera which followed the teacher during the lesson.

For the research presented here I have selected for analysis two of these videos – one of a teacher named Claire[1] and one of a teacher named Connor. Claire has been teaching high school mathematics for 15 years. She teaches primarily the senior (grades 11 and 12) academic courses. Connor, on the other hand, has been teaching for only 8 years, teaches all levels of high school mathematics – both academic and non-academic – and also teaches some junior (grades 8 -10) science.

[1] These are pseudonyms.

RESULTS

In what follows I give a brief synopsis of Claire's and Connor's lesson marked with a time stamp as to when key moments of each lesson occurs. For brevity purposes these synopses focus only on the actions of each of the teachers.

Claire's Lesson (grade 11)

00:00 Claire begins with a brief review of the previous lesson.

06:30 Claire delivers a 'lesson' on calculating the angle θ ($0^o < \theta \leq 360^o$) given a trigonometric ratio r. This lesson involves her giving several examples of how to solve such tasks.

22:00 Claire asks the class to solve for θ: sin θ = 0.8, cos θ = 0.32, and tan θ = 1.2. During this activity Claire circulates and checks on how students are doing. When a student puts up their hand she quickly moves to them and answers their question. The first two questions asked by students pertained to the fact that the ratio for the third question (tan θ = 1.2) is greater than 1.

26:15 Claire stops the activity to re-explain the limitations on the ratios for each trigonometric relationship.

31:00 Claire calls the class to attention and goes over the solutions to each of the three questions.

36:30 Claire gives the next question for the students to solve (solve for θ: 3sin θ + 1 = 2.8; $0^o < \theta \leq 360^{o)}$. Almost immediately many students put up their hands. Claire helps two students to understand the task and begin to solve it.

40:00 Claire calls the class to attention and reviews how to solve the equation $3x + 1 = 2.8$.

42:30 Claire refocuses the students on the original task: 3sin θ + 1 = 2.8.

50:00 Claire calls the class to attention and goes over the solutions to the question.

55:30 Claire assigns homework.

Connor's Lesson (grade 11)

00:00 Connor reviews how to multiply two first degree binomials on the board: $(x + 2)(x + 3) = x^2 + 5x + 6$. He then asks the question, "what do the binomials have to be if the answer is $x^2 + 7x + 6$?"

01:30 Connor places the students into random groups and asks them to work on vertical whiteboards to find the answer. He then begins to circulate amongst the groups as they begin to work on the task.

05:00 Connor stops to speak with a group who is having trouble understanding the task. He re-writes the example as follows:

$$(x + 2)(x + 3) = x^2 + 5x + 6$$
$$(?)(?) = x^2 + 7x + 6$$

He then points to the question marks and asks, "what has to go in here so that the product of the two binomials is this (pointing at the quadratic expression)? I'll give you a hint – look at the last number."

06:00 Connor repeats the above process with another group.

07:00 Connor asks a group who has an answer to check their solution by multiplying the binomials. Once the solution is confirmed he gives the group a new task: $x^2 + 6x + 8$.

07:30 Connor helps another group in the same fashion as above.

08:30 Connor gives a new task to two groups asking them first to check their answer.

09:00 For the next 32 minutes Connor moves around the room giving new tasks to groups that have finished and checked their solution, and helping groups that are stuck. Sometimes he works with two or three groups at the same time. Eventually Connor projects a list of 20 progressively challenging tasks onto a wall. These range from the initial task of $x^2 + 7x + 6$ to tasks as complex as $6x^2 + 10x - 4$. The groups start to move through these tasks one by one solving each and checking their answers.

41:00 Connor gathers the students around one whiteboard and asks them to walk him through how to solve the question $x^2 + 5x – 24$. Connor forces the students to articulate their thinking at each step.

47:00 Connor suggests that the students sit down and write down some notes for themselves on how to solve tasks of the type seen during class.

52:00 Connor projects five more tasks on the wall and asks the students to solve them on their own.

ANALYSIS

As mentioned, these videos were analysed using the framework of flow (Csíkszentmihályi, 1998, 1996, 1990). In particular, I looked for instances of the teacher providing clear goals, providing feedback, and maintaining balance between challenge and skills in each of the videos. In what follows I discuss the results of this analysis organized according to the aforementioned aspects of flow.

Providing Clear Goals

Claire's approach to providing clear goals for her activity involves demonstrating how to solve several similar tasks. Still, she is faced with students that are not clear about one of the tasks. Claire chose to deal with this by addressing the class as a whole about the confusion. When Claire poses the next task ($3\sin\theta + 1 = 2.8$) she is again faced with students who are not clear what the goal of the activity is. She again pulls the whole class together to further explain the task *and* she offers an analogue for how to solve it.

Connor, on the other hand, begins his lesson by reviewing how to multiply binomials and then asks the students to find the two binomials if given the resultant quadratic. Regardless of his differing start to the lesson, Connor is still faced with groups who do not understand the goal of the activity. He chooses to deal with these situations one by one. In all, he needs to work with four groups (two of them at the same time) who are struggling to understand the goal of the activity. After this initial push to help groups get started he has no further issues with groups not understanding what the goal of the activity is.

Providing Feedback

Claire's primary method for providing feedback is whole class recitation. She does this at the end of every activity. During the activity she spends her time helping individual students who are stuck or confused. During this time she will occasionally acknowledge correct solutions and when she encounters a student with an incorrect solution she works with them one-on-one to solve the task correctly.

At the beginning of the activity, Connor is providing feedback on student solutions in much the same way as Claire did – acknowledging correct solutions and working with groups who are struggling. However, Connor very quickly shows the students how they can check their own solutions by multiplying the binomials that they obtained. In so doing, he has established a way for the groups to get instant feedback on their actions.

Regulating the Challenge of an Activity

For the most part, Claire regulates the challenge of an activity with the class as a whole. In the first activity the challenge of the tasks is reduced for the whole class through the explicit lesson on, and examples of, how to solve these types of tasks. She then lowers the challenge even further in the middle of the activity by reviewing the range of ratios possible for the various trigonometric relations. Regardless of the skill level of each individual student coming out of the first activity, everyone was given the second more challenging activity. The challenge of this activity is then reduced for the whole class when Claire shows how to solve an analogous algebraic task.

Connor, on the other hand regulates the challenge of each task according to the ability of each individual group. Groups who need help receive individualized help. Groups whose ability allows them to solve a task are given a more challenging task to work on. Eventually, the students are shown how to check their own solutions and from then on they are able to increase the challenge of the activity as their ability increases.

DISCUSSION AND CONCLUSIONS

The research method used does not allow me to determine if any of the students in either class are in flow (Csíkszentmihályi, 1990, 1996, 1998). More detailed video data, along with interviews and potentially written evidence, is needed to make such a conclusion. From the results presented above I can conclude, though, that it would be very unlikely that a student in Claire's class would be in flow. Few of the necessary conditions are present for this to happen. Although it could be argued that Claire was very careful in ensuring that the goals of the first activity were clear, these goals did not transfer to the second activity. Feedback in her class was primarily provided during her recitations on the solutions of each of the tasks. These were both infrequent and impersonal – providing feedback at times often inappropriate for the diverse stages of solving each of her students were in. Finally, her management of the level of challenge was synchronized with her teaching schedule and not the dynamic abilities of her students.

Connor, on the other hand, created an environment rich in the necessary conditions for occasioning flow. The goals of the activity were established early on and did not waiver as the lesson went on. Feedback was timely and individualized to the groups' varying progress – eventually becoming instantaneous when they learned how to check their own answers. Finally, the challenge of the activity increased in step with each groups evolving ability, first under the individualized attention of Connor and then through each groups own self-regulation.

It is clear from brief synopses of each teachers' lesson (above) that Claire is a traditional teacher while Connor is a progressive teacher. But aside from being able to state the obvious differences in their teaching style there are not many ways to describe these differences in ways that are linked to what we know about good learning. Analysing these episodes through a lens of Csíkszentmihályi's flow (1990, 1996, 1998) is one such ways. Doing so allowed us to see what aspects of Claire's teaching were antithetical to student engagement and what aspects of Connor's teaching helped foster an environment conducive to engagement.

Going forward, it would be interesting to explore the possibility of shifting the descriptive characteristics of an environment conducive to flow – providing clear goals, providing instant feedback, and regulating the challenge of an activity so as to keep it in balance with students' skills – into a prescription for how to construct such an environment.

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