HELPING STUDENTS TO HELP THEMSELVES IN UPPER DIVISION MATHEMATICS COURSES
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ABSTRACT:
This article is about how to direct some specific groups (described in the main article) of students to help themselves in the academic life. Although the specific subject field, Mathematics, is chosen, the process is applicable in general to many different fields. This is not about helping students in particular topics or teaching pedagogy in specific courses but more generally how to teach students to help themselves. Of course, the answer is neither simple nor straight forward as different groups of students require different kinds of help. In this article, the author isolates two such groups (which happen to be the majority of students taking the subject) and described how they are directed to “help themselves”. Some of the advantageous and disadvantageous of each approach is described in detail.

Key Word: “helping students”, “higher education”, “online videos”, “virtual study groups”, “study groups”, “mathematics education”

Introduction:
So what is the problem? As instructors, we did everything we can give our students practice exams, go over homework and quizzes, even give them extra credit assignments and review similar topics several times in the classroom. After doing all these, why the end result is not in its optimum? May be the solution is lying in some places else and, if yes, what is that place? Pamela A. Marshall put this correctly in her article (Marshall):But what is the cause?
Are professors overworked and uncaring or can we blame it on the familiar “kill ’em and drill ’em, teach to the test” philosophy? Among many other possibilities is the suggestion that students are underprepared because they lack appropriate study skills. There are many potential methods to help students once they reach university, including remedial courses, tutoring, and workshops on skills necessary for students to succeed in college. But how does the average faculty member help a student who is struggling? I, myself, have a hard time describing how to study effectively when a student asks for help. And, it’s been almost 20 years since I have taken an exam, so my college and university study methods are quite fuzzy in my mind. Thus, quality resources I can share with a student about how to study effectively in college are useful to me.

So as an instructor, it is important for me to know how to direct a student for more help. This may looks like obvious but as more we think about it, the more puzzling the answer looks. On top of this, the young students that we are receiving are “borne with computers” – they are always texting, chatting, twitting etc. How can we use their skills in computers, like “facebook”, “youtube” to device appropriate help to guide them in the right direction?

The reader may think that I am asking too many questions that answer. It is correct but we can only look for an answer once we know what we are looking for. I am a mathematics professor so I will only talk about my experience in this particular subject and what I observe teaching various types of Mathematics courses throughout several years. We recognize that, the guide for students to help themselves depends (among other things) on the following four important characteristics:

1. What subject the students are seeking help?
2. Is the student taking the subject for the first time or of he/she is a repeater?
3. Is the student a full time worker, have responsibility for his/her family or just a single student?
4. Some other types of arrangements like fulltime or part time, how many hours the students can spend on that particular subject, have high speed internet connection in his/her home etc.

**Students Body for my college:**

I teach in Hostos community college which is a part of City University of New York (CUNY). City University of New York, like many other universities in the US, has diverse body of students. Thus a single method of teaching cannot be appropriate for all the students. Susan and Linda (Susan and Linda) described this fact as follows:

By now it is axiomatic to point out that student bodies are increasingly diverse, not only in terms of ethnicity and gender, but also in terms of age, nationality, cultural background, etc. This diversity can affect classroom settings in many ways, including the diversity of learning styles.

The Hostos Community College is located at the heart of Bronx and at least 70% of the population is Hispanic. Usually, in a typical class, 60% of the students are Hispanic and 30% are Black and 10% are other ethnicity. African-American and Mexican-American students are more likely to prefer working with others to achieve common goals (Banks). It was also pointed out that the metaphor of dialogue is more appropriate in that it emphasizes the interactive, cooperative, relational aspects of teaching and learning (Tiberius).

So we need to rethink our traditional way of teaching where students are thought of as empty bag and we fill them up with as much knowledge as quickly as possible.
We also need to think about how much of this knowledge is in fact retained by our students for the long run. McKeachie (McKeachie) pointed out the following:

In a typical 50-minute lecture class, students retain 70% of what is conveyed in the first 10 minutes but only 20% from the last 10 minutes. If we really want to get our message across, we need to orchestrate “the material” in a multi-faceted way across the range of student learning styles.

Thus a uniform help does not exist which will work well for all the groups of students. Since the students body is diverse, they also deserved a diverse help.

**Type of problems my students are faced:**

I taught from remedial mathematics courses (like elementary algebra) to upper level mathematics courses (like linear algebra and differential equation). When I analyze the problems that my students are faced every day, I found many similarities and differences. Some of the common problems can be categorized into two broad categories:

1. Students do not have appropriate background which is needed for the course – this may be because of the break of study or the instructor in the previous courses did not go over all the materials in detail
2. Students do have appropriate background but did not keep up with the materials and then fall behind because of some other responsibilities including full time jobs, family responsibilities etc.

**Prescription for helping students to help themselves:**

This article is not about how to help students in mathematics but how to guide a student so that he or she can help himself. Now I will describe what is some of my suggestions that I applied throughout my career and which one often ended in a good result. I will break it down according to the two categories described
above:

**Students do not have appropriate background:**

In fact majority of my students fall into this category. Before one week of the start of the class, I invite all students (in particular, I encourage those students who think that they need to refresh the concepts from previous courses) to log into the blackboard and watch some videos. I found out that students feel easy to watch videos than to read a part of the book or some articles. These videos are chosen very carefully by me. These are collected from various sources prominently from “Khans Academy” and “Youtube”. These videos are typically short, concise and right to the point – otherwise I will lose the focus of my students. If I cannot find a right video for a particular topic, I will make the video by myself.

For example, for a calculus II class, I will invite students (one week before the class start) to log into the blackboard and watch few videos on some specific topics selected from Calculus I and Pre-Calculus. In this case, the specific topics will be some key concepts from Calculus I and Pre-Calculus which I feel very important in Calculus II. These include, derivative of trigonometric functions, derivative of exponential and logarithmic functions etc. These videos are arranged in the right order of topics so that if a student feels that he or she already knows the material can move to the next video and also students who need to start with Pre-calculus, start with the beginning of the videos. Of course, there are various disadvantages that the readers probably already guess about this approach. I need to make it clear that it is not in any way possible to go through one year of materials in just a week. But the idea is to go over just some particular selected topics which are extremely important for the course at hand and also it is assumed that students know about the material at some point of their life and just forget about it. So they are not learning
the topics from scratch. I also found out that there are some technical and logistical issues with this approach. When I invite students through email to log into the blackboard, not all students check their emails and know about the invitation. A few students register just the day before the class start and even after this.

There are some byproduct benefits that I received which I have never thought about before about this approach. When students click a link for a video, after they finish watching it, they will be given more links for similar videos. This will open a big horizon for them from where they can learn and refresh a topic which they may forget. This also has a downside, especially for youtube. In the youtube, anybody can post anything and thus when students divert too much from the actual link posted in the blackboard site (whose contents are checked by me for accuracy), students may ended up with inaccurate videos. But at least it shows to the students that internet is not just for “facebook” and “twitter” but it also can be used for educational purpose.

I also found out that the tutoring intervention in the beginning of the semester is extremely helpful. There are many articles in the literature which talks about the effectiveness of tutoring in the learning process of students. For example in “Does help help?”(Chang, Beck and Mostow) measures the effectiveness of one such process in an affirmative way. In my cases, I did not take any measurement of effectiveness but the usefulness of this approach is clear from the students opinion and the result of their feedback. For the early tutoring intervension, in the first day of class, I request students who needs to refresh on previous topics (or for some reason their previous instructor did not go over some topics) – whatever the reason is to form a study group. I will write down some topics in the board so that all students know about it. Then I will assign one or two tutors to work with these study groups extensively in the first one week of
the class. To facilitate the process and to encourage students, I also told my class that I will give two/three quizzes on the first week of class which will be based on topics from previous courses. My first homework is also based on solely on these preliminary topics. I also found out that when students form study groups in the beginning of the semester, although initially it is to study preliminary materials, they stick with the study groups all through the semester. Few students reported that if it is not for the study groups, they will not succeed in the course.

In summary these groups of students have two methods of helping themselves – online videos and study groups with tutors – both should be extensively applied in the first week of the semester. Using both method at the same time is very effective.

**Students who work full time and have family responsibilities:**

Teaching in a community college I found that many students from my class falls into this category. Compare between the day class and the evening class, the evening class has more students in this category. Typically these groups of students cannot keep up with the assignment (simply because of the time restriction) and fall behind.

Mathematics is such a subject that when students fall behind in a particular topic, it will have dramatic effects on the learning of the subsequent topics. These groups of students are neither lazy nor bad students but in the contrary they are quite smart students. I told them to buy the loose leaf version of the class text book. I told them to take only two pages from the book (these pages are selected by me), which is very easy to carry in the book bag, when they go to work. I request them to read one page when they go to work and one page when they are coming back from the work. The pages of the book are selected by me in advance according to the day by day schedule of the course. This way, even if they miss a day, they will not completely lost in the
next lecture. Although they may not understand everything that they are reading, they reported to me that it helps them to keep track and they are not falling behind. Some of them keep doing it for other subjects and told that it is very effective for them. They are using the time, which they spend in the bus or in the train, in a good way. In a quick survey in my class, I found out that in average students are spending about 12 hours per week in the road – going to and from the home, work and college.

Of course, there are other traditional help that students need to use (true for all students and not just for this particular group) including office hour, tutoring center etc. For the majority of the students in this group, they work during the office hour – in fact they have a very little free time to study. Tutoring center often open until 10 pm at night but few of them said that they are very tired after a long day of work and also they take classes in the evening. It is also impossible for most of them to form a study group. So what is the solution? I asked them to form a “virtual study groups” – using the blackboard platform students with the same time schedule form virtual study groups. I found out that many of them have iphone and going to the internet is not a problem for them. Since these virtual study groups are created based on similar time schedule and there is no physical limitation, they can talk and chat in the middle of the night if they want to. Many reported that majority of them meet in the virtual world between 11 to 12 midnight and they help each other explaining homework problems and study for the test.

**A Qualitative Analysis:**

At the end of each semester (for the past two semesters, spring 2012 and fall 2012), the author conducted a brief survey in the form of a questionnaire. The following four statements were asked and in each case the student was asked to circle a number between 1 and 5 where 5 means strongly agree.
1. The online videos are helpful to refresh the topics from previous courses (series 1)
2. Study groups and tutoring interventions help me to succeed in this course (series 2)
3. Virtual study groups are helpful in my busy life and help me to do my homework and study for the test (series 3)
4. Reading selected pages from the textbook in the road going to and from the work, home and college is very helpful (series 4)

All the data were collected and converted to percentages. A bar graph is given below where each of the questions above represents one color. We immediately see that majority of the students tend to like the idea of “online videos”, “virtual study groups” and “reading in the subway”.

![Bar Graph]

**Conclusion and Future Direction:**

All of these strategies to “help students to help themselves” are in the qualitative process. A quantitative approach should be done although it might be difficult. This will be the author’s next direction – to justify scientifically the effectiveness of the approach described in this article.
REFERENCES:

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