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Summer Learning Loss and Summer Programming: How to Build a Cohesive Mathematics Education

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SUMMER LEARNING LOSS AND SUMMER PROGRAMMING: HOW TO BUILD A COHESIVE MATHEMATICS EDUCATION

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Abstract

Students across the world are learning at an incredible rate. By the end of each academic school year, most students have amassed a large amount of knowledge. But what happens to that knowledge over the summer? Research shows that most students make no academic gains over the summer; some even regress in their content knowledge. In order to build a cohesive education across academic school years, research has shown that attending a summer academic program may help. Students that attend a summer learning program may be more successful the next academic year, which in turn builds to a greater overall level of content knowledge that students can carry into their futures.

Table of Contents

CHAPTER I: INTRODUCTION

For many children and teenagers around the world, summer vacation is something to look forward to. They can relax, enjoy the weather, get together with friends, and enjoy some time outside of the classroom. However, this absence from the classroom often leads to stagnant, or even a decrease, in general academic skills (Cooper, Nye, Charlton, Lindsay & Greathouse, 1996). Are students really losing these academic skills over the summer? What can we do to prevent this loss?

I did not recognize that this was an issue until I taught a group of students for two years, back-to-back. During the first year with these students, I taught Honors Algebra II. The course covered many topics, but one of those topics was factoring quadratics. The students seemed to perform quite well, remembering the process and what to do when. One student in particular, Parker*, was very eager to perfect the process. He was excited to figure out the "puzzle" of factoring and fitting the numbers into certain spots. He scored very well on the factoring exam as well. Early the next school year, when the students were in Honors Precalculus, factoring quadratics was covered again. The same students could not seem to recall how to factor, and some could not even recall learning it the year before. Parker was lost. He remembered enjoying the process of factoring, but had no recollection of the process or even what factoring was used for.

This lack of retention caught my attention. How could students forget this content in less than half of a year? Had I not taught them well enough? Eventually, I came to find out that this loss of retention exists not only in my classroom, but in schools around the United States, no matter the students' age (Cooper et al., 1996). Students are enjoying their summers with many different non-educational activities, as they may feel like they need (or deserve) a "break" from

intellectual stimulation. However, not revisiting content in a reasonable amount of time results in an overall loss of retention and knowledge (Ebbinghaus, 1964). Thus, students are coming back to school from summer break with less knowledge than when they left, and struggling to catch up with the content.

This summer learning loss affects students of all ages. It is not only prevalent in grades K-12, but even in college students (Dills, 2016). However, the middle school and early high school years are possibly the most critical times to intervene with some sort of summer learning opportunity. Intervening at this crucial time could help to prevent additional negative student consequences, such as further learning deficiencies and students dropping out (Ilic, 2011). Stopping, or even slowing the problem earlier can encourage students to stay in school and be positive about their learning experiences, instead of frustrations and learning gaps building on each other over time.

While all types of students are affected, there is more research supporting the fact that students coming low-income and minority families are more affected by this summer learning loss (Heynes, 1978). These students are the ones that may need the most intervention over the summer. Providing an opportunity for these students could help to lessen the achievement gap between low-income or minority students and other students.

Combatting this issue would result in many positive outcomes. Overall knowledge retention is helpful, especially for mathematics, as one class often builds on the previous class. Students could score higher in general on exams, whether it be in class or on a standardized test. Teachers could have more time to spend on new material, as opposed to spending time covering the same material for a second time. Student engagement and confidence may also rise, as students may feel as though they had just gone over the material and have a grasp on how to

begin or solve various problems. Families and schools may not have to spend as much money on extra materials or staffing to help students catch up, and can focus on the content that the students are "on track" to learn.

If students have such a loss in retention, especially over the summer, what can we do to prevent it? One solution may be a summer academic program. There have been many studies performed that prove the effectiveness of summer learning programs in preventing summer learning loss (Cooper, Charlton, Valentine, Muhlenbruck & Borman, 2000). Some summer programs are for all students, and some summer programs are for specific subgroups of students. No matter who the summer programs are geared toward, they seem to have a positive effect on students. There are some common denominators in running an effective summer program, as well. Running an effective summer program to bridge academic school years may be a solution.

There is a program called the Summer Bridge Program, which is offered through AVID (Advancement Via Individual Determination). AVID is "a global nonprofit organization dedicated to closing the achievement gap by preparing all students for college and other postsecondary opportunities" (avid.org, 2017). The AVID Summer Bridge programs are designed to strengthen students' mathematics and science skills and to increase the number of students who enroll and succeed in middle school mathematics and advanced mathematics courses. Students volunteer for the program, select either a science or mathematics curriculum, and attend four weeks, four days a week for four hours per day.

AVID is a school-year program designed for students that are traditionally underrepresented in colleges and universities. One of AVID's goals is, therefore, to close the often discussed "achievement gap". The students that attend the AVID program and Summer Bridge are often first-generation college students, minority students, or students from low-

income families. While these are not requirements of being an AVID student, AVID's goal is to help these students reach their goals and dreams of being successful in college and beyond.

AVID's Summer Bridge program is filled with activities to draw students in, so that learning in the summer becomes fun and enticing. The students participate in various activities, from traditional note-taking, to games and field trips. Students often get the chance to work in pairs or groups to not only stay engaged, but share ideas about mathematics and learning. They can also learn and demonstrate leadership skills in these groups and pairings. The program provides many engaging activities for the students to stay active and captivated throughout the program. I have taught the program for three years as well as tutored in the program for one year.

The success of the AVID Summer Bridge Program has been shown by multiple AVID coordinators. AVID compiles data on the students that attend the program. They measure the success of the program by analyzing student grades the year after they attend the program. Students are lumped into "A" groups, "B" groups, and "C or lower" groups and presented as groupings in a bar chart.

As a current high school mathematics and AVID teacher, I propose implementing the AVID Summer Bridge Program in my school district. A new summer learning program in my current school district would be invaluable to students, teachers and parents. Students can strengthen their current mathematical skills and be more prepared for the next year. They can revisit content they may have struggled with the past year, or preview content that is to come. Practicing their skills at a time in between academic years would be helpful to all students. They do not need to be AVID students to be accepted or attend the program.

I have taught the program in other school districts in Minnesota, and have seen firsthand how the students interact and explore the content together. Though there are many logistics

involved in starting the program for the first time in a district, I believe that the positive evidence for the program is worth the costs associated with starting it up. I have created introduction letters, surveys, a timeline, and budgeting ideas to ensure that the program would be a success in my school district.

CHAPTER II: LITERATURE REVIEW

Introduction

Many different sources were found and utilized for research in this thesis. These sources were found from searching in EBSCO MegaFILE, ERIC (EBSCOhost), Google Scholar, Academic Search Premier, JSTOR, and SAGE Journals Online. All sources in the search were peer-reviewed, and range from 1964 to 2018. Older studies were only considered if they were "landmark" studies (i.e. commonly cited in more recent sources). Search terms included "curve of forgetting," "summer learning loss," "summer learning program," and "summer math program." This chapter will review these sources and synthesize information regarding content loss over time, learning loss over the summer, and the effectiveness of summer programs to prevent summer learning loss.

Traditionally, most schools in the United States have a nine-month school year. This was originally developed to allow children and teenagers to attend school, as well as to help harvest crops on their family farm during the summer months (Kerry & Davies, 1998). At the start of the 1900s, this traditional school calendar started to be examined. Did students lose content knowledge over this summer break? Can we prevent this potential loss with summer educational programming? This thesis will examine these questions by analyzing and synthesizing many studies regarding content loss over time, specific cases of learning loss, and effective summer learning programs geared toward all students, as well as programs for specific subgroups of students.

Many studies have been performed regarding memory, loss of content over time, and specific learning loss over summer. This chapter will explore some of these memory studies. Some studies examine specific content areas and learning over the summer, which will be

examined. Other studies look at summer learning loss between different types of students, such as exceptional learners, students of different races, and students of different socioeconomic backgrounds. Additionally, some studies look at summer academic programs that have been studied, and their effectiveness analyzed. Some of the summer program studies are for specific subgroups of students, or certain content areas, and some are for all students. Together, these studies paint a picture of the importance of summer learning opportunities for all students.

Forgetting Content Over Time

The Curve of Forgetting

There have been many studies of the memory and how humans forget things over time. One landmark memory study that is commonly referred to was done by Hermann Ebbinghaus in 1880 and 1885. Being the only subject in his experiment, he attempted to learn a list of nonsense syllables and recorded how much he remembered after various time intervals. He also reviewed the lists and recorded how much he remembered after reviewing them after similar time intervals. After analyzing his data, he found a link between the time since learning a concept and how much someone remembers. The amount someone remembers decreases dramatically as the time between reviewing that material increases. However, reviewing material between the 24-hour and 31-day mark since initially learning material massively improves retention (Ebbinghaus, 1964). The mathematical model that represents retention can be altered, and the amount forgotten can be lessened by reviewing the material more frequently.

Though this study was performed quite some time ago, the results have been replicated and confirmed in multiple studies. For instance, in Murre & Dros (2015) conducted a similar experience in which one of the authors attempted to learn lists of nonsense syllables. He learned ten lists of syllables and relearned them after 20 minutes, one hour, nine hours, one day, two

days, or 31 days. Then, they measured how long it took for him to relearn the lists in order to recall them perfectly, and compared that time to how long it took him to initially learn the lists, quite similar to the Ebbinghaus study. After analyzing the data, it was shown that the longer time between learning and relearning, the longer it took the subject to replicate the syllables. At 20 minutes after initially learning the list, he was able to relearn and recall the information fairly quickly. However, after one hour, it took longer to relearn the material, and it took longer and longer as the intervals between learning and relearning grew. This is an example of just one study out of many that replicated Ebbinghaus's experiment in a modern-day setting.

Application of the Curve of Forgetting

Some studies apply the "Curve of Forgetting" to learning other, specific tasks, as opposed to just learning nonsense syllables. For instance, one study by Rose and Wheaton in 1984 found that with general procedural and psychomotor tasks, the longer the time between learning and relearning the task, the longer it takes to relearn it. In 1989, Bailey conducted an experiment in which 35 adult subjects learned an on-the-job task. They were assigned a time period, attempted to replicate the task, relearned it, and then replicated the task again. The most interesting thing he found was that when relearning the task, the most important indicator of the speed of relearning was how long the interval of time between learning and relearning was. It didn't matter how long it originally took the subject to learn the task--what mattered was the length of time between performing and re-performing the task.

An interesting study by Ginzburg and Dar-El (2000) examined this learning retention and proposed a model for learning and re-learning skills with soldiers of the Israel Defense Force. Fifty-three subjects that were trained in electronic warfare learned a job-specific task and had to re-perform that task at different time intervals. The first thing the study found was that the level

of performance after certain time intervals followed the same forgetting curve that Ebbinghaus introduced: the longer the time between learning a task and having to re-perform it, the less proficient the subject is. It took the subjects that had a three month period between performing the task the first time and the second time a longer time to relearn the task than it did for subjects that only had a one-month wait time. This study is especially interesting because of the time periods tested. The longest time that a task was revisited was three months, which corresponds to a traditional summer vacation for many students.

Curve of Forgetting in the Classroom

This "Curve of Forgetting" and learning loss directly applies to students' learning over the summer. Say a student learns content in class during the school year, and reviews it at the end of the year for a final exam. After that, the student has approximately three months with no revision of the material. According to the Ebbinghaus study, after 31 days without review, a student would only retain about 21% of that material. However, if the content is reviewed, the student will be able to retain a much higher percent, and the Curve of Forgetting would reset at 100% retention at the time of review. This bridges the gap between the end of the previous school year and the beginning of the following school year, and students would then be able to learn new content at the beginning of the school year, rather than having to review the information at the beginning of the next school year.

Summer Learning Loss

Early Studies

Numerous studies have been performed specifically about loss of learning over the summer. One of the earliest studies dates back to 1906. In this elementary study, William White studied seven students and found that they retained much of the information over the summer,

but took a bit longer to recall the information (Cooper et al, 1996). After that, there were many more early studies of student performance before and after summer vacation. While many of these studies revealed no significant loss of learning over the summer, some of the statistical methods of analysis are now considered outdated.

One of the most comprehensive studies on summer learning loss across all age groups was performed by Cooper et al. in 1996. They performed a meta-analysis on 39 different studies before 1996 by compiling all of the studies' data and comparing spring scores to fall scores. After analyzing all of the data, they concluded that, in a worse case scenario, students' achievement scores overall declined after a summer vacation. In the best case scenario, student learning was stagnant over the summer and showed no improvement.

Loss of Mathematical Skills

In the aforementioned 1996 Cooper study, it was shown that student learning either declined or was stagnant over the summer. This was evident for language arts, reading, and mathematics scores; however, the loss of mathematics skills was the most profound out of the three subject areas. An earlier study had already established the fact that students lose a significant amount of mathematical skills over the summer (Alliner, Fuchs, Fuchs & Hamlett, 1992). A 2015 study by Paechter et. al followed students over the summer and conducted a pre-summer and post-summer test. Reading scores surprisingly went up over the summer, but mathematical skills dramatically declined.

This loss of mathematical skills could be due to many reasons. The researchers theorized that it could be because math learning involves memorization and performance of many procedural skills. This was also evident in the Ginzburg and Dar-El study, when soldiers learned procedural tasks and forgot the procedures over time. Another reason Cooper et al. (1996)

theorized that students did worse in mathematics after the summer months is that for other subject areas, children have more resources to learn language and reading at home, whereas mathematical skills often are not accessed or practiced without a formal school setting.

Regardless of the reasoning behind the loss of mathematical skills, the implications are huge. Students and teachers cannot rely on what they learned the year before--rather, teachers will often have to re-teach, and students will often have to practice content again. Students that were already struggling with content will get further and further behind, and will have to relearn content year after year. This takes away from time to learn new content and build off previous knowledge.

Different Age Groups

More recent studies have examined summer learning losses in different age groups. Many studies have been done in the elementary ages, where early retention is critical. The 1992 Allinder et al. study produced data that showed that students experience little spelling and mathematical summer learning loss in grades 2 and 3, and more significant summer learning loss in grades 4 and 5. Another study in 2013 by Sandberg, Patton & Reschly examined reading scores in second through fifth graders. They found that students in grades 2 and 3 exhibited summer reading learning loss, while students in grades 4 and 5 did not. Contrary to that those findings, the Cooper et al. study (1996) found that summer learning loss seems to worsen as the students get older. Students in first and second grade did not have a significant learning loss over the summer, but students in the higher elementary ages had a much more significant learning loss.

This learning loss even extends into college-aged students. In one study of students at Clemson University, data was collected from students that were taking a two courses during

successive semesters (Dills, Hernández-Julián & Rotthoff, 2016). The study found that students that took the courses in the fall followed by the spring exhibited minimal learning loss, while the students that took the course first in the spring, then in the fall, showed significant learning loss.

Achievement Gap

Another area of research is related to the often-discussed achievement gap and summer learning loss. Many studies have researched students that are from low-income or minority families, and concluded that the achievement gap between these students and other students widens even more without any summer learning (Kerry & Davies, 1998).

A landmark study supporting this notion came from Heyns in 1978. She studied data from students in Atlanta, Georgia, and found that the achievement between students from rich and poor families widened even more over the summer. She found this same result between black students and white students (Heyns, 1978). With even more (and different) data, Heyns performed another study in 1987. She found the same results as before; a lack of summer learning widened the gap between minority students and other students, as well as between low-income students and other students (Heyns, 1987).

While Heyns's studies were performed some time ago, many more recent studies support her findings. In the Cooper et. al meta-analysis (1996), it was found that students with a lower family income had a lower overall understanding of content after the summer break. These students had significantly higher losses, especially in reading, compared to middle- and higher-class students.

Downey, Von Hippel, and Broh (2004) also conducted a study to take a look at the achievement between students in different socioeconomic groups, as well as students of different races. They took data from kindergarteners and analyzed their achievement both during the

school year and during the summer months. While much of their study examined schools and how to reduce the achievement gap, the study provided evidence that the socioeconomic and racial achievement gap widened more over the summer months than during the school year.

Another study involving low-income learners was conducted by Borman and Benson (2005). While examining the successfulness of an elementary summer program, the researchers examined the summer learning loss of students that did not attend the program. All students in the study were from high-poverty households. They found that the students that did not participate in the summer learning program experienced a significant loss of learning. Within the students that did not attend the program, they found that the income of the family's household did not affect the level of content knowledge loss. They theorized that this could be due to the fact that all of the households examined were considered "high poverty," and the difference in income wasn't significant enough to have an impact.

In a 2007 study by Alexander, Entwisle and Olson, there was an achievement gap found between high school students that had a lower socioeconomic status and those with a higher socioeconomic status. They then traced this back to summer learning deficiencies from when the children were very young. As the years went on, this achievement gap widened.. They concluded that early summer learning intervention of low-income students can lessen the gap between those students' achievement and the rest of their peers.

Summer Learning Programs

In an attempt to combat this summer learning loss, there have been many summer academic programs offered and studied. These studies range from elementary to high-school programs. There are a wide variety of programs, including programs for specific socio-economic groups, programs for English language learners and special education students, and programs for

all types of students. Finding and implementing an effective summer program could be the key to keeping students up to date with their learning throughout the calendar year.

General Summer Learning Programs

Numerous summer programs have been studied and their effectiveness analyzed. One of the most comprehensive studies that analyzed many different summer programs was by Cooper, Charlton, Valentine, Muhlenbruck & Borman (2000). They took 93 different summer programs and analyzed their effectiveness. They found that overall, summer programs are effective not only as remedial programs, but also as acceleration programs. This result extended to all students, regardless of background.

Another study of a summer program for students was performed by Mariano and Martorel (2012). They studied the effectiveness of a summer program in New York for underperforming fifth-grade students. While they found strong evidence of growth in the subject area of English language arts, gains in mathematics were less significant. However, as they followed the students through middle school, they found that the students that attended the summer school had better achievement through seventh grade in both language arts and mathematics than the struggling students that did not attend the summer program.

Summer Mathematics Programs

Some studies refer specifically to the success of summer mathematics programs. In the 2000 Cooper et al. comprehensive summer school analysis, different summer programs for different subject areas were analyzed. It was found that summer mathematics programs may produce even larger gains than summer programs in other subject areas. This result also extended to students of all backgrounds. The researchers theorized that this may be because the control

group, who did not attend any summer program, may have had access to information associated with other subject areas at home, but not materials associated with mathematics.

Another study that pointed specifically to a mathematics program was a 2014 study by McCombs, Payne, Augustine, Schwartz, Martorell and Zakaras. This study examined students across the United States their mathematics scores against students that did not attend the summer program. They discovered a large gain in mathematics scores for students that attended the summer program, with no significant gains in reading in a similar summer program.

In a 2016 study by Kermit Snyder, a summer mathematics program was conducted with 145 third- through fifth-graders. Their scores on post-tests were then compared to their peers' scores who did not attend the summer program. When Snyder analyzed the students' scores, he found that the students' overall achievement scores did not show improvement. However, he did find that the students that attended the summer program did show a significant lessening of summer learning loss.

One study by Lynch and Kim (2017) looked at a summer mathematics program that took place outside of a classroom. Students were given a laptop and a free subscription to an online mathematics program. Though student achievement scores generally did not rise, it is interesting to note that student and family engagement in mathematics rose as a result of the program. Children, parents and family members began to have conversations about mathematics during the summer, which is a small step toward integrating academics into students' summer vacation.

Exceptional Learners

Some studies focused on a specific subgroup of students and their summer learning loss. In the 1996 Cooper et. al study, learning loss over the summer was greatest for students in special education. When Cooper then analyzed summer programs in 2000, some of the summer

programs were for special education students, as well. Therefore, the analysis of the effectiveness of summer programs can be extended to exceptional learners as well.

In 2016, Zeng, Benner & Silva analyzed a summer program for students at risk for emotional-behavioral disorders (EBD). The summer program was for fourth graders, and had ninety two participants that were struggling academically. The students participated in a program that focused mainly on literacy. It was found that the summer program was effective in not only increasing student reading and language scores, but also helped to lessen student self- and emotional-regulation skills and conflicts.

A 2016 study examined the summer learning of students that were English Language Learner (ELL) students, and students that were on an Individualized Education Plan (IEP) (Gersheson & Hayes, 2016). When analyzing survey and testing data, it was found that these exceptional learners do make significantly more gains, especially in reading, if they attend a summer program. They also found that the gain in summer learning was higher for students from high- and medium-income families.

A recent 2018 study examined a summer mathematics program for gifted students in ten school across two different school districts. The researchers found that the program was effective for the students in strengthening their mathematics skills (Little, Kearney, O' Brien, Adelson & Cash, 2018). This success was for all students that attended the program, regardless of race and/or familial income level.

Another subgroup of students that require summer attention is students learning a language other than their native language. These students often lose knowledge of the new language gained during the school year if they continue to speak their native language at home, and don't get to practice the new language (Stanat, Becker, Baumert, Ludtke & Eckhardt, 2011).

A summer program of students learning German as their second language was conducted by Stanat et al. (2011). After attending the program, these students performed better at grammar and reading than their counterparts that did not attend the summer program. They tested the students three months after attending the program, and the students were still significantly ahead of the same peers in German reading skills.

Programs for Low-Income Students

There is an abundance of evidence that the achievement of children from low-income families is lower than those from middle-income families (Heyns, 1987). When analyzing a plethora of summer programs, Cooper et al. found that summer programs for middle-income students were even more effective than summer programs for low-income students. Though this could be for many reasons, the authors theorized that one reason may be because low-income students and schools may not have the resources to conduct the most effective summer programs for students.

Some studies are specific to summer learning programs for these children in low-income families. In a 2006 study by Chaplin and Capizzano, over 1,000 low-income elementary students were selected to participate in a six-week summer program called Building Educated Leaders for Life (BELL). The participants' test scores were then compared to their peers that did not participate in the summer program. After data was analyzed, it was shown that these BELL program participants gained about a month's worth of reading skills ahead of their peers that did not attend the BELL summer program. Also, this study showed that the children that attended the program were more likely to be encouraged to read by their parents after attending the program. Not only did the program have an immediate effect on students' ability to read, but parental encouragement could boost learning in the future, as well.

Another previously mentioned study by Borman & Benson (2005) studied over 300 elementary-aged students that were from high-poverty households. These children attended a summer program called Teach Baltimore. Researchers examined the students' reading scores before and after attending the program and compared them to students that did not attend the program. Students that attended the program experienced significant gains in achievement scores, especially compared to their peers that did not attend the program.

Postsecondary Summer Programs

There have also been studies done on summer programs after high school. Typically, these programs are in place to advance college readiness for students entering into college. One such study examined the success rates of students in mathematics and reading courses after attending a summer bridge program between high school and college in eight different universities in Texas. The study concluded that the difficult topic of college readiness could not be easily solved by a summer program. However, the study did show that students that participated in the summer program had a significantly higher probability of getting credit for their mathematics credits their first year of college. This student success could be attributed to a summer learning boost from participation in the bridge program (Wathington, Pretlow & Barnett, 2016).

Effective Summer Programs

It is evident that there is a disconnect between the learning at the end of one school year to the beginning of the next school year, so what makes an effective summer program? Some studies examine effective summer programs and compare their characteristics. A few impactful characteristics include making learning fun and interactive, relatable and useful in the real world. The content should be aligned with the curriculum taught in the two successive school years.

Students should have small class sizes, and teachers should be trained and experienced (Terzian, Moore & Hamilton, 2009). Other effective characteristics of teachers include collaborative planning in advance, commitment to positively developing children, and having strong leadership skills (Bell & Carrillo, 2007).

The 2000 Cooper et al. study that assessed a multitude of summer programs also offered characteristics of an effective summer program. Summer programs that ended closer to the start of the next school year were more effective than earlier programs, but the length of the program must be delicately balanced--not too long for students, but not too short so that the program begins too far from the previous school year. In addition, according to the study, teachers need to plan early as to avoid stress during the program. Summer programs with smaller class sizes were more effective than programs with larger class sizes.

The 2005 Borman and Benson study also found links as to what made the Teach Baltimore successful for students from high-poverty households. The program, they found, was successful because it was structured and geared specifically to combating summer learning loss. The researchers also noticed that when parents support their child's attendance at the summer program, student achievement was higher.

A 2011 study by Blazer and Miami-Dade Public Schools analyzed effective summer programs and offered information on a how to make them successful. Making programs accessible and affordable for all students was important in running a successful program. Student experiences should also be different that classroom experiences during the traditional school year to increase engagement. Summer programs also need to be offered for younger students, as that can get them engaged in summer learning, and can also combat a summer learning loss early.

Conclusion

Overall, students forgetting what they learned is a big problem, whether it be over a day, a weekend, or over a long summer break. There is a large amount of literature supporting the fact the students especially lose learning over their summer vacation. Many different summer programs have also been studied around the world, for all different types of learners. The overall consensus is that summer programs are generally effective in boosting student recall of content between school years.

CHAPTER III: APPLICATION

As the previous chapter has shown, there is a plethora of evidence to support the idea of summer programming to prevent a summer learning decline for students. In the school district I teach in, there is a need for a summer program that is not solely to recover credits. The summer program needs to be set up with certain ideas in mind in order to maximize success.

According to a study by Johns Hopkins University in 2005, there are nine characteristics to a successful summer program. They are

- intentional focus on accelerating learning;
- firm commitment to youth development;
- proactive approach to summer learning;
- strong, empowering leadership;
- advanced, collaborative planning;
- extensive opportunities for staff development;
- strategic partnerships;
- rigorous approach to evaluation and commitment to program improvement;
- clear focus on sustainability and cost-effectiveness (Bell & Carrillo, 2007).

While there are many different summer program opportunities available, adhering to these nine characteristics when designing a summer program has the potential to create a successful experience for students, staff, and parents. An example of a program that is designed to follow many of these characteristics is called the AVID Summer Bridge program.

Background

The AVID Summer Bridge program is designed for middle school mathematics students. The purpose of running the program is to boost student achievement in mathematics, while

simultaneously combating the learning loss that happens over summer. With the approval of their teachers, students also have the opportunity to switch into an honors mathematics course if they are not already in one after attending the program. The program is voluntary. Recommended students should be in the academic middle who show good work ethic and a positive attitude toward academic growth. There is no specific criteria for recommending students for the program; teachers observe students in their classroom throughout the school year and recommend them accordingly. Though AVID is an elective class during the academic school year offered by some school districts, students do not need to be AVID students to attend the Summer Bridge Program.

AVID has collected data on the Summer Bridge Program to measure its effectiveness. Data was collected from students in the program in 2012 and 2013 ("Math for 7th Grade," 2013). They analyzed the grades seventh and eighth grade students that were a.) in "on-track" level classes and stayed in them, b.) students that went from an on-level class that moved into an advanced class because of the program, and c.) students that were in an honors class and stayed in the honors class. For seventh graders, in 2012, after attending the Summer Bridge Program, 65% had an A or a B in mathematics. In 2013, after attending the Summer Bridge Program, 58% had an A or B. For eighth graders, in 2012, 70% received an A or B. In 2013, 62% scored an A or B. While no data was available to compare these numbers to, it is evident that a large number of the students were very successful in their next math class, as they earned either an A or B.

Students attend the Summer Bridge Program for four weeks, four days a week, and for four hours a day. They are bused to the site and start their day with a provided breakfast and a content "warm-up." The students then do a wide range of activities, from group activities to presentations to games and active movement activities (see Appendix A). Students may be sitting

and taking notes for a few minutes a day, but most of the time they are creating their own learning by making posters, teaching others, and competing in different games to sharpen their skills. Students get to have an active time to link their body and brain. All of their materials are provided by the program. At the end of the day, students are provided lunch, and are bused home.

Implementation

In order to begin the program, there are many preliminary steps that are necessary to follow. The first step in the process will be to apply to run the program through AVID. This will happen in January, as the program will run in the summer. After acceptance by AVID to run the program, teachers for the program will be recruited. Selected teachers should be ready and willing to work in a high-energy and collaborative environment in the classroom. Students will then be identified by their mathematics teacher as a potential candidate for the program. Next, in early April, parents will be sent a letter identifying their child as a candidate for the Summer Bridge Program (see Appendix B). Parents that are interested can fill out the form on the letter and return it to their child's math teacher (see Appendix C). Once the applications are received (mid-May), parents will receive a letter confirming their child's enrollment in the program (see Appendix D). In early June, parents will be mailed busing information. Finally, a week before the program start date, parents will receive a phone call from their child's Summer Bridge teacher introducing themselves and detailing arrival instructions.

Costs

While this program has the potential to be extraordinarily beneficial for students, there are many costs associated with running it. The largest cost will come from paying the teachers for training and teaching. Other staff should be on hand as well, such as administrators, a nurse,

and custodians. It will cost money to feed the students breakfast, lunch, and a snack. There are also costs associated with busing the students to and from the school. There is also a fee that AVID charges for a district to use the program. There are also costs associated with supplies, such as teacher guides, interactive notebooks for the students, and other school supplies for the activities in the classroom.

Costs associated with the program can be high; however, there are ways to combat high costs. Schools across the nation are running this program, and some receive aid from state equity and integration programs. For example, the AVID Summer Bridge Program run by Lakeville Public Schools, in Lakeville, MN, receives funding from the Achievement and Integration Program from the Minnesota Department of Education. The program could be run at the same time as summer school, as buses, some staffing and facilities would already be in use. If necessary, alternative breakfast and/or lunch ideas could be explored. School districts could also pair up and run the program simultaneously, in order to share some of the costs.

Sustainability

After the initial implementation, it would be easier and less costly to continue running the program for future years. The fee from AVID for running the program decreases after the first year. State and/or federal aid may be easily renewed. The school supplies purchased for the first year could be used for future years. Teachers may return from year to year, so teacher recruitment could be easier. Students may talk about their positive experiences with the program, so student recruitment could be easier, as well.

There are some difficulties to consider for implementing the program. For instance, funding could be a problem, as some districts may not be able to receive funding from state or federal programs. It may be difficult to find effective teachers for a program in the summer.

Student recruitment could be difficult if it is a new program. Also, many students are naturally averse to summer learning opportunities. It could also be difficult to find field trip opportunities for the program in the summer, as some places only offer them during the school year.

While some people are convinced that the potential benefits of the program outweigh the costs associated with running the program, it may be difficult to convince everyone of this fact. It may be difficult to convince district officials that the program could be extremely beneficial without official analysis of the data. However, providing officials with the research in this paper could be an important key in convincing them that the program is necessary.

Conclusion

Overall, it is evident that there needs to be some action taken to prevent the loss of knowledge over summer vacation. The AVID Summer Bridge program has the potential to be a solution to this problem. The program has many elements that allow students to learn in an environment that doesn't "feel like school" in the summer. Implementing a program such as AVID Summer Bridge could be an excellent step in maximizing the successfulness of students.

CHAPTER IV: DISCUSSION AND CONCLUSION

Summary

In general, parents, teachers and educators want students to be successful and to continue to learn and build upon previous knowledge. However, when there is an interruption in the school year, student learning may stagnate and or maybe even regress. There needs to be some sort of remedy for this issue.

In the past, many studies have examined knowledge and learning loss over time (Ebbinghaus, 1964; Murre & Dros, 2015). Multiple studies have provided evidence that students lose knowledge over time, and specifically over summer break (Alexander et al., 2007; Allinder et al., 1992; Cooper et al., 1996; Downey et al., 2004; Heyns, 1987; Kerry & Davies, 1998; Sandberg & Reschly, 2013; Snyder, 2017). Many studies have also shown that minority students and students from low-income backgrounds seem to have the largest degree of learning loss over the summer (Cooper et al., 1996; Heyns, 1987). Together, these studies paint a picture of a problem in the traditional school systems that must be addressed.

In order to address the problem of summer learning loss, there have been many summer learning programs that have been studied and proven as effective (Augustine et al., 2016; Chaplin & Capizzano, 2016; Cooper et al., 2000; Gersheson & Hayes, 2016; Ilic (2011); Little et al., 2018; Lynch & Kim, 2017; Mariano & Martorell, 2013; McCombs et al., 2014; Snyder, 2017; Stanat et al., 2012; Terzien et al., 2009; Wathington et al., 2016; Zeng et al., 2016). Some effective summer programs are for certain subgroups of students, and some are for all students. For instance, one program may be designed specifically for low-income students, or another program may be solely for gifted students. Some studies even analyze effective summer programs to compile a list of the characteristics of the most effective summer programs.

Together, these studies show that summer programs can be effective at maintaining a student's learning over the summer.

One program that aims to close the summer learning gap is the AVID Summer Bridge Program. There is evidence to suggest that the implementation of a summer program such as this one could help to close the gap between academic school years. There are many advantages of using this program, including an engaging curriculum and providing real-life applications. Students could engage their bodies and minds over the summer. Then, when students return to school in the fall, they would have more retention from the year before. Teachers wouldn't have to spend a large amount of time reviewing old material, and students could have the time to extend their learning beyond what they already know.

Overall, students lose learning over the summer. However, just knowing that there is a problem is not enough. In order to fight against this, there have been many studies on summer programs to help strengthen students' academics over the summer. Students need some sort of intervention over the summer if they want to have a connected, cohesive learning experience that they can use later in their learning and in their lives.

Professional Application

Based upon this research, it is evident that students need some sort of learning opportunity during the summer in order to have an effective, connected education. One promising option might be a year-round school calendar; however, in some parts of the world, this may be unrealistic or unreasonable. Some people may argue that students deserve time to relax, decompress, and enjoy their youth while they're still young. Some areas of the world may need time for children to help their families during certain times of the year.

In the United States, school districts should consider providing summer opportunities for students that are positive, engaging and exciting, no matter the students' age. Teachers that consider participating in summer learning programs should be committed, enthusiastic and forward-thinking.

Limitations of Research

There are many limitations when it comes to the research on summer learning loss, effective summer programs, and specifically the effectiveness of the AVID Summer Bridge Program. A lot of research has been done on the summer learning loss of elementary-aged students, but much less has been done on secondary students. There is also a plethora of information on the summer learning loss specific to students from low-income families, but other subgroups of students are not studied as much. These studies therefore don't assess all populations equally, and may not be translated to other types of students. Also, many of the studies focus on different content topics (most predominantly reading), and the research may not fully translate to mathematical and other skills and abilities.

The research for the success of the AVID Summer Program is also limited. AVID only provided raw data, and no analysis. This leaves many questions about the data and how to interpret the data. It also makes it hard to compare the data to the students that did not take the program. These students could have been just as successful as the students that took the program, or maybe the teachers were very effective that school year and helped everyone overall achieve at a high level. Therefore, from the raw data given, we may not be able to infer that the program was successful.

Based upon the research available, it is hard to make distinct conclusions about an entire population of students. However, taking each study individually is important to paint a picture of

student populations as a whole. We can then assemble a picture of what the student population may be lacking over the summer, and how we might help them to bridge the gap between school years.

Implications for Future Research

In the future, there are still numerous questions that need to be answered. More research could be done on summer learning loss of students overall and more specific groups, primarily at secondary levels. More studies could be done with mixed populations; this would help paint an overall picture of students and summer learning loss. Instead of assuming that certain summer programs are effective, more summer programs need to be individually studied and analyzed. These analyses could be for all students or students from specific income levels and/or races. That way, we could identify which programs are most effective for certain groups, or what we could do to help the overall student population over the summer. The AVID Summer Program data could be analyzed and compared to the level of students that did not attend the program. This would help to analyze the effectiveness of the program.

After doing research on the topic of summer learning loss and summer programming, there are more questions that come to mind. For example, why do some studies give conflicting information on the degree of summer learning loss? Why is there more learning loss in certain subjects, but not in others? Finally, why do some studies give different characteristics of effective summer programs?

There is much more research that could be done on the topic of summer learning loss and summer programs. Sorting through and analyzing more and different students and summer programs could be the key to finding out exactly what is happening to students over the summer, and how to help them maintain a level of learning that can aid them in the next school year.

Conclusion

Overall, students are losing content knowledge over the summer. From one school year to the next, students are forgetting what they learned, and teachers are taking precious time to reteach material. Students are not capable at the beginning of the school year of doing what they could at the end of the previous school year.

We can attempt to combat this issue by implementing and running effective summer programming that engages and challenges students. Though it may be difficult to begin, design, implement and run an effective summer program, the potential benefits outweigh the potential downfalls. This is why a summer bridge program should be considered for implementation in school districts throughout the summer.

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Appendix A

Timeline for activities on a typical AVID Summer Bridge day:

7:45 a.m.-8:15 a.m. Arrival and Breakfast

8:15 a.m.-8:35 a.m. Warm-Up Activity

8:45 a.m.-8:55 a.m. Everything Has Its Place Activity

8:55 a.m.-9:15 a.m. Decimal Partner Review

9:15 a.m.-9:35 a.m. Adding, Subtracting, Multiplying and Dividing Decimals Cornell Notes

9:35 a.m.-9:55 a.m. Decimal Duos Activity

9:55 a.m.-10:10 a.m. Tribal Challenge: Decimals

10:10 a.m.-10:40 a.m Decimal Scavenger Hunt

10:40 a.m.-10:55 a.m. Snakes and Humans Story Time

10:55 a.m.-11:25 a.m. Mini-Lesson Using Two-Color Counters

11:25 a.m.-11:45 a.m. Adding and Subtracting Integers: Cornell Notes

11:45 a.m.-12:05 p.m. Snakes and Humans Integer Practice

12:05 p.m.-12:15 p.m. Reflection: Decimals and Integers

12:15 p.m.-12:45 p.m. Lunch and Dismissal (Summer Bridge Curriculum Sampler, 2014).

Appendix B

Summer Bridge Math Academy
For Current 5th, 6th and 7th Grade Students
Advancing Math Skills

April 10, 2018

Dear Parent/Guardian:

Great news! You are receiving this letter because your student has been recommended as a candidate for the Summer Bridge Math Academy, which is designed to advance students' math skills, with a goal of working towards honors math. We are offering a unique summer opportunity for our current 5th, 6th and 7th grade students whose achievement and academic growth scores indicate consistent improvement in their math skills. The Summer Bridge Math Academy uses engaging, interactive and *FUN* collaborative lessons, activities and math-related field trips that strengthen math skills and foster a love for math!

The Summer Bridge Math Academy is sponsored by White Bear Lake Equity Services and is free of charge. Classes are taught by licensed math teachers from White Bear Lake at Central Middle School . Transportation, materials, breakfast and a snack are included. Classes begin July 9th and end August 3rd. Classes run from 7:45-12:30 Monday through Thursday. Families will be notified about busing routes and room locations as the start date draws closer. Students will receive a confirmation mailing with busing routes by the end of May and a phone call from his/her teacher about a week before classes begin.

Please review this information with your child. We hope you will consider enrolling him/her in the Summer Bridge Math Academy! At the end of the session, participating students will take the MAP Mathematics test to determine appropriate math placement for the 2017-2018 school year. The Summer Bridge Math Academy does not guarantee placement in honors math, but it provides an opportunity for students to work towards this goal. We hope your student's math skills will grow through this experience, making their upcoming school year and math studies successful, regardless of their course placement.

Please apply online. If you are unable to apply online, complete the registration form on the back of this letter and return it to your child's current math teacher. If you have any questions, contact Jill Osborne at

Sincerely,

Ms. Jill Osborne
Summer Bridge Math Academy Coordinator

Appendix C

Get a jump-start on math and accelerate your math skills for this upcoming school year by participating in Math Summer Bridge Academy! Registration will close when we reach capacity so register early! Registration will officially close May 15th.

Dates: July 9-August 3, Monday through Thursday

Time: 7:45 am – 12:30 pm – includes light breakfast and snack

Location: Central Middle School (White Bear Lake)

Transportation requested (circle one): Yes No
Busing will be provided based on district eligibility policy.

_____**6th grade math for 5th grade students –**The focus areas include fractions (multiplication, division), and measurement, data (mean, median, mode), ratio, rate, perimeter, decimals, and multi-step word problems.

_____**7th grade math for 6th grade students** –The focus areas include measurement (2-dimensional figures), rational numbers (fractions, decimals, percent), algebraic concepts (multiple representations), coordinate graphing, and probability (models).

_____**8th grade Algebra for 7th grade students -** The Algebra Readiness program strengthens students' understanding of fundamental math and algebraic concepts to provide a solid foundation for success in Algebra I. The content focus areas include measurement (Pythagorean Theorem, surface area, volume), rational numbers (squares, square roots, negative numbers), algebraic concepts (solving equations), multiple representations of functions, coordinate graphing, and probability and statistics.

Parents - Please Complete

Student's Legal Name _____

Male ____ Female____ Grade (current) _____

Address _____

School attended (2017-2018) _____

Student Email_____

Parent/Guardian Name(s)_____

Home Phone #(_____)_____ Parent/Guardian Cell #(_____)_____

EMERGENCY Contact/Relation to Student _____ Phone # (_____)_____

Parent E-mail address _____

Please list any medical conditions _____

Appendix D

Math Summer Bridge Academy
For Current 5th, 6th & 7th Grade Students
Advancing Math Skills

May 15, 2018

Dear Parent/Guardian:
Great news! You are receiving this letter because your student has been **accepted** into Summer Bridge Academy. This academy is designed to advance students' math skills. The Summer Bridge program uses engaging, interactive and *FUN* collaborative lessons and activities to strengthen student math skills.

The Summer Bridge Academy is sponsored by the White Bear Lake Office of Equity and Integration. This opportunity is free of charge. Transportation, materials, breakfast and a snack are included. The Academy begins July 9th and ends August 3rd. Classes run on Mondays - Thursdays from 7:45 a.m-12:30 p.m.

Families will be notified about busing routes and room locations as the date draws closer.

Sincerely,

Jill Osborne
Summer Bridge Coordinator