Unexpected Effects of Using SAFMEDS to Teach Taxonomy

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In AY 96-97, the Chicago Annenberg Foundation funded a series of Precision Teaching (PT) workshops for elementary school teachers. This paper reports an unexpected outcome detected by one of those teachers (the second author) deploying PT in a 6th grade gifted science classroom of the Chicago Public School system. In previous years, the teacher would spend a total of six weeks combining lectures and laboratory covering the unit taxonomy (i.e., kingdom, phyla, class...) In 1997, the teacher and students developed SAFMEDS for each kingdom and certain phyla. Students did the SAFMEDS and kept data on their own individual Change Charts. To the surprise of the teacher, the students had mastered more taxonomic words and concepts than past years and at a faster rate. This enabled the teacher to include more specimens for study because lab assignments were completed more rapidly. The unexpected effects were that with the PT method of teaching instructional time was reduced by one third while more material was addressed and high levels of student competence were achieved. Implications for using PT methods in other curriculum areas and its potential effects are discussed.

During the academic year of 1996-97, The The issue of size was not addressed because the schools represented in the workshop had small classroom size.

Some of the workshop sessions were dedicated to teaching the school teachers and principals how to read, plot, and interpret the Standard Celeration Charts. Students' data were plotted and evaluated in the Standard Celeration Charts and Practice Charts developed by Ogden Lindsley and associates (Potts, et. al., 1993). Precision Teaching data displayed on the Change Chart allows teachers to more efficiently track their student's learning and assist in instructional decisions. In addition, the use of this data gave students, teachers, and principals additional levels of information regarding learning and progress.

One teacher (the second author) teaches 6th grade science at the Thomas Edison School in Chicago, Illinois. This school is the regional gifted center fir a district located in the Northwest side of Chicago. A major problem which faced the teacher and his colleges was the insufficient amount of time available to cover all the information his 6th grade science students must learn within the school year.

One of the subjects covered in his classroom is biological classification. Biological classification (taxonomy) was developed to recognize and interpret similarities and differences among organisms. Understanding and learning is thought to be much easier if the organisms are assigned to groups that are ordered and ranked (Purves, Orians, & Heller, 1992). Thus, classification systems serve a number of important roles.

Annenberg Foundation funded a number if projects in Chicago which attempted to address three educational issues: 1. Isolation – how to improve communication of information between teachers and principals regarding curriculum and student performances; 2. Time - how to improve time management issues in spite of growing curriculum requirements as well as how to more effectively instruct students given the amount of time available; and 3. Size – how to cope or implement reductions in student body classroom sizes.

To meet these issues we developed the Practitioners' Collaboratory and held a series of workshops on PT (Potts, et al., 1993). The workshops met weekly for one semester then bi-monthly over the remainder of the school year. The group was called the Collaboratory because PT helped eached participant to design, implement, and test their own educational questions in their classroom as a laboratory, while the PT data cummunication system fostered our collaboration. PT thus addressed time and isolation bacause it gave methods to improve their effectiveness as instructors (time) while the Change Chart (Standard Celeration Charts) gave them a new data language with which to effectively communicate (isolation). In addition, the Workshops brought teachers and principals together and e-mail gave the participants more rapid communication across geographically scattered sites.

On one hand it enables us to remember the characteristics of a large number of different things by grouping them into categories. Secondly, it enhances our ability to explain relationships between things. For example, specific organisms which fall within the plant or animal kingdom can be properly categorized whose particular members share many characteristics.

Science teachers have the task of teaching taxonomy, which includes a new science vocabulary. Hence, learning new words and their meanings is a necessary component of any science curriculum. Miller and Calkin (1980) described learning a science vocabulary as similar to learning a foreign language. Common practices os to begin with the most general category and move to more specific information, so the teacher begins with the five kingdoms: animals, plants, fungi, protista, and monera. Teaching the students key component skills and their underlying tool elements to fluency facilitates their use of that information to perform more complex tasks (Johnson & Laying, 1992). Thus, mastering the differences and similarities of the five kingdoms is a component for the students to learn the different phyla, classses, families, genius, and species within the kingdom.

In the past, the teacher would spend four weeks lecturing on the different kingdoms, phyla, classes, and families. The students were tested at the end of each week responding to questions with short written answers as well as making charts of the calssification system. Grades were determined by percentages of correct answers. This segment was followed by 2-3 weeks of laboratory where the students attempted to identify unknown organisms by listing reasons for and against the organism fitting into a given kingdom, phylum, and class.

METHOD

Through the workshops the teachers was introduced to PT along with SAFMEDS. He elected to pilot the use of SAFMEDS on the taxonomy curriculum segment. He and the 32 students in the class developed SAFMEDS for each kingdom and certain phyla. Students did the SAFMEDS and kept data on their own individual Change Charts. Instead of lecturing for 4 weeks, class time was dedicated to developing SAFMEDS covering facts related to the five kingdoms. The teacher developed the first 15-20 SAFMEDS which the students copied and studied. Individual students continued to developed their own sets which were proofed by the teacher; approximately 90 SAFMEDS were developed for each set. For example, one side of a SAFMED would read "move to get food" and the other side would read " animal". Students practiced and were tested by the teacher on the compiled SAFMEDS throughout the week. Data were collected and plotted on the Standard Celeration Chart at a minimum of every other day. Final aims were established at 75 correct per minute and 0 incorrect per minute. Individual grades

Were established for frequency aims.

RESULTS

After three weeks using SAFMEDS, the teacher reported that he had actually lectured on less material but his students had covered more material and learned more in less time. Figure 1shows the celerations of corrects and incorrects for the class. The celerations' spread for corrects is more tightly clustered compared to celerations' for incorrects. The three celeration lines for incorrects which are located near the 10 line represent three students who were possible targets for instructional interventions. Figure 2 shows one student's SAFMEDS performance where corrects accelerated x1.4. This student was able to reach his aim for incorrects earlier than planned. While the improvement in student's performance using SAFMEDS is expected (McDade, Austin, and Olander, 1985) the teacher also reported some unanticipated outcomes of this method.

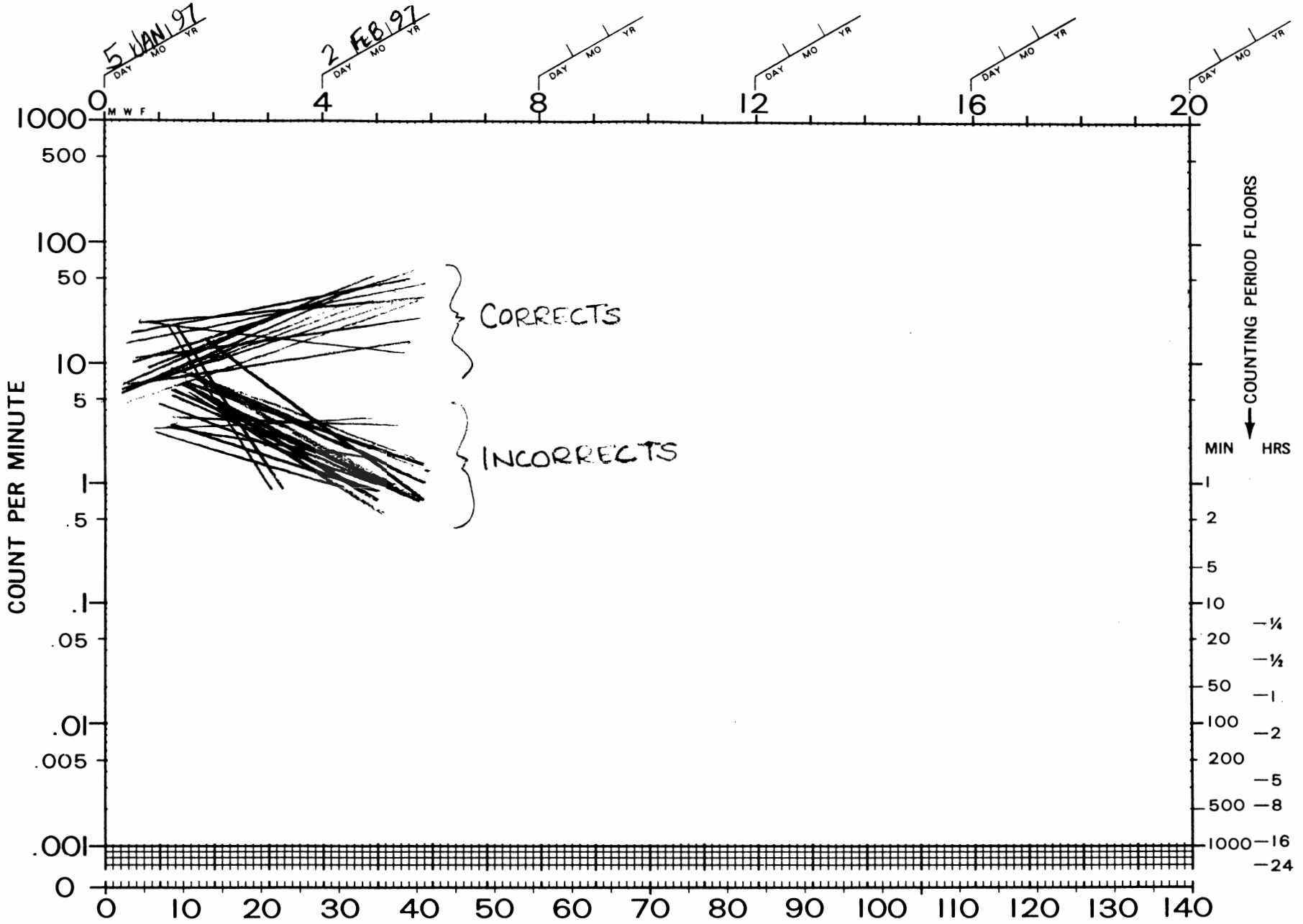
The teacher reported that the students had more readily available information to calssify the live organisms. They did not spend the same amount of lab time looking for the correct vocabulary in their notes (i.e., cilia, flagella, faltworms, mollusks), the text book, or asking for teacher assistance. In addition, the students were completing their lab assignments at a faster rate, which enabked him to include more specimens and cover more material.

DISCUSSION

The concluded that by using this method of teaching he had saved at least one third of the instructional time while addressing more material. That is, two weeks of learning time was saved form the six to seven weeks previously spent on this material. For the next year, he also believes by having the students test each other, as opposed to him doing all the testing, will save even more time. In this case, the curriculum of biological classification does not change from year to year (like much of his topics), but the difference between previous years was his method of teaching this topic. Anecdotally, through the use of these tools the students seemed to be very active learners; to be owners of their learning. They seemed to progress more rapidly and learn more independently of him rather than relying exclusively on the lectures and text. The impression is that this environment fostered learning, autonomy, the rewarding of success, the immediate addressing of academic delays, and students also had fun doing it.

In addition to the students' learning, the experience was a unique learning experience for the teacher. During the weeks of implementing SAFMEDS he often felt uncomfortable and hesitant. At times he believed he was not giving his class all the information he believed was necessary. He had feelings of "short changing" them. However, by the end, based on quantitative and qualitative information, his students had learned more and had learned faster, suggesting that these specific teaching methods and tools can have profound effects in important issues such as time and effectiveness. The Change Chart and SAFMEDS provided by the workshop are tools which the teacher can now use in other areas of his teaching.

These types of outcomes raise the possibilities of an effective instructional system that teaches more to students with higher levels of achievement in less time. We may speculate upon the productivity and organizational climate that would result in a school that used these techniques for all classes and levels. If a one-third time savings could be obtained across the board, students could master 9^{th} grade work by 6^{th} grade even if the time savings is simply additive. For example, this sort of savings means that older students time could be redepolyed to help younger peers. Another



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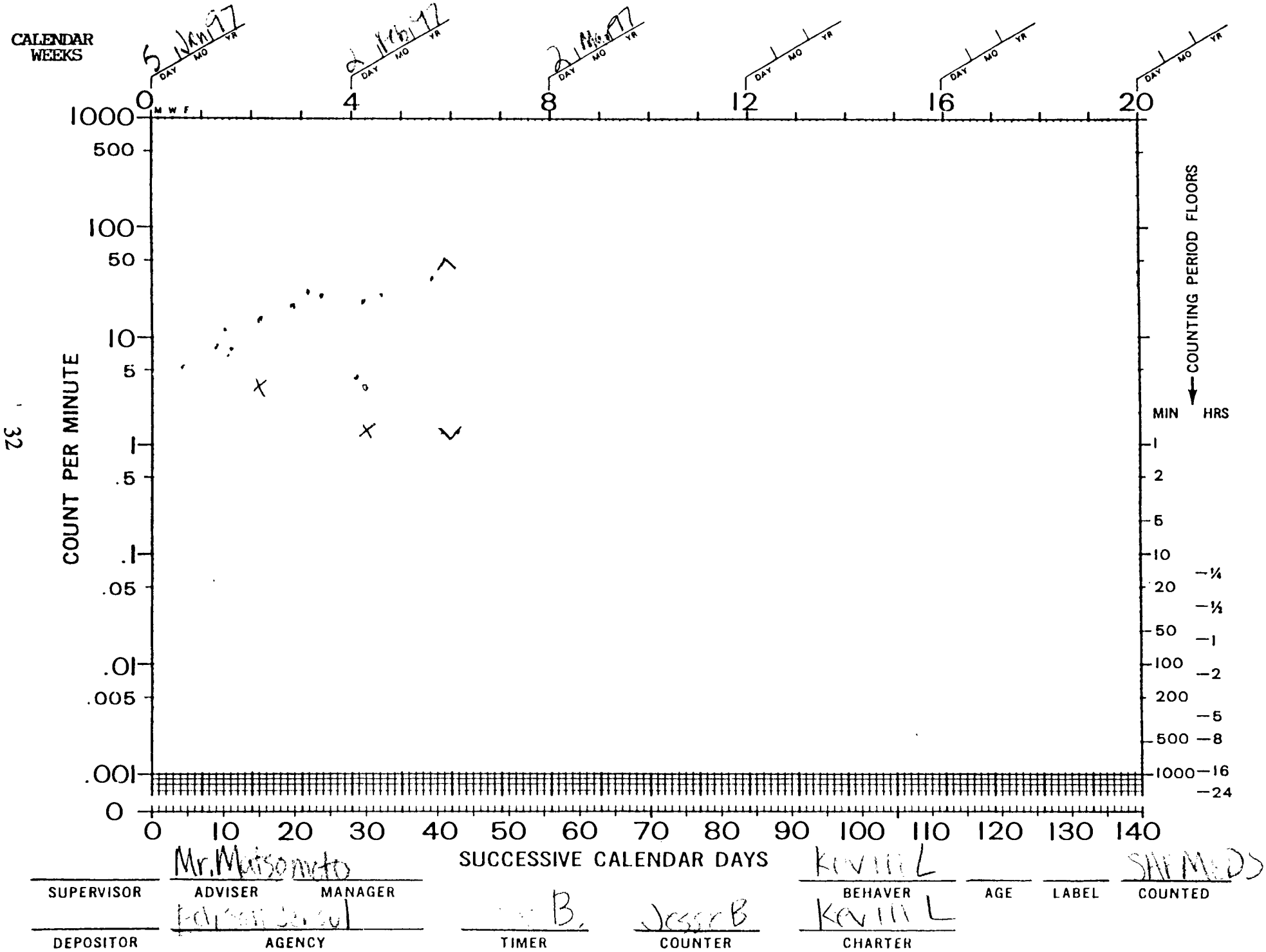
BEHAVER AGE LABEL

SAFMEDS - TAXONOMY FACTS

COUNTED

DEPOSITOR AGENCY TIMER COUNTER CHARTER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SUCCESSIVE CALENDAR DAYS
SUPERVISOR
Mr. Matsumoto
ADVISER
MANAGER
KEVIN L
BEHAVER
AGE
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TIMER
Jesse B
COUNTER
KEVIN L
CHARTER

alternative is that additional topics or skills could be mastered. Educators using PT techniques like SAFMEDS may explore these and other options.

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