What Works in Remediation: Lessons from 30 Years of Research

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Introduction

Remedial courses have been a fixture in American community colleges since these institutions first appeared in postsecondary education at the turn of the 20th century. In recent decades, however, remedial courses have proliferated in the community college (Cohen & Brawer, 1989). According to a recent National Center for Education Statistics (NCES, 1996) study, 99% of the nation's public community colleges currently offer remedial courses in one or more subject areas.

For most of this century, however, remedial courses have not been the subject of serious research. As Norton Grubb (1998) points out, "Because remedial education has developed as a solution to a particular problem – the lack of educational progress of many students – almost no one views it as valuable in its own right" (p. 3).

As a consequence of this attitude there have, until recently been relatively few attempts to determine the most effective practices in college-level remediation. This section explores these attempts in an effort to identify the most effective techniques for teaching remedial courses and organizing and delivering developmental education programs.

Method

A review of the literature in developmental education was carried out to identify information on remedial instruction and related topics. Sources for this literature review included the *Annotated Research Bibliographies in Developmental Education* (Saxon, et al., 1999)*, the Annotated Bibliography of Major Journals in Developmental Education, Volumes 1* (Spann & Durchman, 1991) *& 2* (Spann & Drewes, 1998)*, the ERIC Clearinghouse for Community Colleges, and other ERIC data bases. This review yielded a literature base of approximately 600 books, articles, and technical reports on the topic published in the past 30 years.

These books, articles, and reports were reviewed to identify literature employing at least a semblance of some recognized research methodology. Those included met the following modest criteria:

> (a) the manuscript must have clearly explained the methodology employed to obtain its findings;

> (b) the methodology must have been free of at least the most basic methodological flaws;

(c) the manuscript must have explored techniques, theories, or models directly related to remedial or developmental education; and

(d) the manuscript must have had a postsecondary education focus.

In essence, this meant that all editorials, articles based solely on opinion, or program reports with no evaluation information to support them were discarded from the study.

As O'Hear and MacDonald (1995) pointed out, they found the literature base in developmental education to be methodologically weak, with almost two thirds of the research reflecting serious methodological flaws. We also found this to be true in our review of the research. As a result, the majority of books, articles, and reports from the original database were excluded from this study. The final report was based on just over 200 pieces of literature.

In the course of this review, two general trends in research on remedial and developmental education became apparent. One trend was for research to explore methods and techniques that characterize effective instructional activities for remedial courses. The other trend was for studies to explore program components and organizational structures that characterized successful programs. The findings were organized to include both of these trends and to analyze them in a chronological manner. The emphasis here was on identifying early research findings that have been consistently validated by later research. Attention was also given to more recent research findings that, although lacking long-term validation, still show promise for improving the quality of practice in community college remediation.

Findings

Early Studies and Later Validation of Research on Remedial Instruction

Much of the early research on effective techniques for providing remediation was conducted by John Roueche and his colleagues at the University of Texas - Austin. In fact, a review of the literature indicated that between 1968 and 1978, Roueche and his colleagues published more books and articles on remedial education than all the other authors in the field combined. Because of this, any discussion of effective techniques, models, and methods for remediation must rely heavily on the early work of Roueche and his colleagues.

Initially, their research was based on reviews of the literature to identify components of learning theory most applicable to remedial courses (Roueche, 1968; Roueche & Wheeler, 1973). Given the prevalence of behaviorism in the learning theory of the time, many of their findings were heavily influenced by behaviorist thinking. Nevertheless, behaviorist techniques tended to be successful with remedial students, and much of the literature that recommended these techniques has been validated by later research.

Of particular note were findings regarding the importance of establishing clear cut goals and objectives for remedial courses (Roueche, 1968; Roueche, 1973). Later studies by Donovan (1974), Cross (1976), Kulik and Kulik (1991), and Boylan, Bonham, Claxton, and Bliss (1992) also found that remedial instruction based on carefully defined goals and objectives was associated with improved student performance.

Apparently, understanding the goals of a particular course and knowing exactly what the instructor expects students to accomplish facilitated the learning of underprepared students. Furthermore, studies showed that the specification of course goals and objectives also facilitated the establishment of a clear course structure, another component of successful remediation.

Mastery learning. Roueche and his colleagues also emphasized mastery learning as a component of effective remedial instruction (Roueche, 1968; Roueche & Wheeler, 1973). They were particularly influenced by the work of Bloom (1968) and Carroll (1963) in this regard. All of the approaches to mastery learning utilized small units of instruction and frequent testing and required students to be able to master the material in one unit before progressing to the next unit. This emphasis on mastery was beneficial to students in remedial courses because it provided regular reinforcement of concepts through testing. An emphasis on mastery required students to develop the prerequisite knowledge for success in a given course and to demonstrate this knowledge through testing.

Discussion: Mastery learning. Although mastery learning is not nearly as popular today as it was in the 1960s and 1970s, the evidence has suggested that it is still a highly effective instructional technique for remedial courses. Research by Cross (1976), Kulik and Kulik (1991) has also strongly supported the use of mastery learning for remedial courses. Students exposed to mastery learning techniques in remedial courses were more likely to pass these courses, obtain higher grades, and be retained than students whose remedial courses were taught using more traditional techniques (Boylan, Bonham, Claxton, & Bliss 1992).

A recent study of remedial courses in Texas community colleges also found that students taught using mastery learning techniques were more likely to pass a statewide achievement test in the remedial subject area than students taking remedial courses which did not feature mastery learning (Boylan & Saxon, 1998).

Degree of structure. Another principle emphasized in the early research was that of structure. Roueche (1973) found that students taking remedial courses required a high degree of structure for their learning experiences. Cross (1976) later argued remedial students tended to lack the organizational schema necessary to comprehend many academic concepts. The provision of highly structured learning experiences helped students compensate for this shortcoming by modeling appropriate methods of organizing information.

Based on their research on the interaction between student aptitude and instructional methods Cronbach and Snow (1977) also argued that structured learning environments provided the most benefit to the weakest students. Their position was further supported by the research of Kulik and Kulik (1991) and Boylan, Bonham, Claxton, and Bliss (1992).

Variety of teaching methods. The use of a variety of different teaching methods was also recommended in the early studies of remedial instruction (Roueche, 1968; Roueche & Wheeler, 1973). Students in remedial courses have been lectured to in the past without much effect. If traditional teaching methods had worked for these students, they would not be taking remedial courses. Consequently, Roueche and his colleagues argued for the use of a wide variety of teaching techniques featuring class discussions, group projects, and various types of mediated learning.

Again, these early findings have also been validated through later research. Cross (1976), Kulik and Kulik (1991), and Casazza and Silverman (1996) all found that students in remedial courses were likely to be more successful when a variety of instructional methods were used.

Perhaps one reason why this finding has appeared consistently in the literature has to do with the learning styles of remedial students. The body of research suggesting that remedial students learn in ways not accommodated by traditional instruction has been growing. Canfield (1976), for instance, found that students enrolled in community college remedial courses were much more likely to be either iconic (visual) or hands on learners than other students. Using a modified version of the Kolb Learning Styles Inventory, McCarthy (1982) found that weaker college students tended to be more visually oriented or more inclined to learn through direct experience than other learners. Lamire (1998) cited half a dozen studies of community college students indicating that a dominant learning style among them was visual followed by what he referred to as haptic or learning by doing. Apparently the use of a variety of instructional methods, particularly those using visual or hands on approaches to learning were more likely to appeal to the learning styles of students typically enrolled in remedial courses.

Theory-based courses. Another early finding from the work of Roueche and his colleagues was that remedial courses were most effective when they are based on sound cognitive theory (Roueche, 1973; Roueche & Wheeler, 1973; Roueche & Kirk, 1974). Citing the work of Bruner (1966) and a variety of other instructional theorists, Roueche (1973) argued that remedial instruction should be systematic and clearly based on what we know about how people learn.

These findings were echoed in later work by Stahl, Simpson, and Hayes (1992) and Casazza and Silverman (1996). A recent study of Texas community colleges found that students were more likely to pass a state mandated achievement test following remediation when remedial courses were based on recognized theories of teaching and learning (Boylan & Saxon, 1998).

Early Studies and Later Validation of Research on Remedial Programs

In later work, Roueche and others began to look at successful community college remedial education programs in an attempt to identify those components or activities associated with student success (Roueche & Kirk, 1974; Roueche & Snow, 1977; Roueche & Roueche, 1993; Roueche & Roueche, 1999). Many of their early findings on program components have also been validated by later studies.

Centralized program. Roueche and his colleagues have long advocated that remedial courses and services should be provided by a separate and centralized program as opposed to individual academic departments (Roueche & Kirk, 1974; Roueche & Snow, 1977). This finding was later validated by Donovan (1974), and Boylan, Bonham, Claxton, and Bliss (1992). Students participating in centralized remedial programs were found to be more likely to pass their remedial courses and more likely to be retained for longer periods of time than students participating in decentralized programs.

Discussion: Centralized programs. Recent analysis of these findings, however, suggests that it is not a centralized program structure alone that contributes to success but the coordination and communication afforded by such a structure (Boylan, Bliss, & Bonham, 1997). Obviously, coordination of effort and communication among faculty and staff providing remediation occurs most easily in a centralized program. However, decentralized programs in which there is strong coordination of remedial education activities and abundant communication among those who teach remedial courses may be just as effective as centralized programs (Boylan, Bliss, & Bonham, 1997).

Program evaluation. Another early finding supported by later research has been the importance of evaluation to the success of remediation efforts. Donovan's (1974) analysis of successful programs for at-risk students found that those that evaluated their efforts on a regular and systematic basis were more successful than those that did not. This finding was echoed in Roueche and Snow's (1977) study of successful remedial programs. Boylan, Bonham, Claxton, and Bliss (1992) later found that program evaluation was positively related to student grades in remedial courses and also associated with the long-term retention of remedial students.

Further analysis of data from the National Study of Developmental Education suggested that the relationship between program evaluation and student success had a great deal to do with how program evaluation information was used. Apparently, programs performed better when evaluation included a combination of formative and summative evaluation and when formative evaluation data was used to refine and improve the program (Boylan, Bliss, & Bonham, 1997). This emphasis on the use of formative evaluation for the purpose of program improvement was also found to be associated with student success in a recent study of Texas community colleges (Boylan & Saxon, 1998).

Program definition. Early studies of remediation also argued that successful programs should be guided by a clearly defined philosophy accompanied by clearly

specified goals and objectives (Roueche & Snow, 1977). Later work by Casazza and Silverman (1996), Maxwell (1997), and Boylan and Saxon (1998) also reinforced this finding. The presence of an underlying program philosophy accompanied by program goals and objectives based on this philosophy appeared to characterize successful programs.

Discussion: Program definition. This finding has, in fact, been incorporated into recent professional association guidelines for program certification. Certification guidelines established by the National Association for Developmental Education (Clark-Thayer, 1995) require that programs seeking certification specify their operational philosophy and describe the program goals and objectives based on this philosophy as part of the requirements for obtaining certification.

Mandatory assessment and placement. Early research also identified mandatory assessment and placement of students in remedial courses as a characteristic of successful remediation efforts (Roueche & Baker, 1987**;** Roueche & Roueche, 1993; Roueche & Snow, 1977). Later authors have continued to advocate for mandatory assessment and placement and have provided a variety of arguments and research studies to support their advocacy (Casazza & Silverman, 1996; Maxwell, 1997; Morante, 1987; Morante, 1989). However, the available evidence suggests that only mandatory *assessment* is clearly associated with student and program success in remedial courses (Boylan, Bonham, Claxton, & Bliss, 1992; Boylan, Bliss, & Bonham, 1997).

The early identification of those students at risk of failure was, indeed, found to be associated with successful remediation (Adelman, 1999; Kulik, Kulik, & Schwalb, 1983). This seemed to support the argument for mandatory assessment and placement. Mandatory *placement* in remedial courses, however, appeared to have a statistically significant, negative impact on the retention of students in remedial programs (Boylan, Bonham, & Bliss, 1994).

Discussion: Mandatory assessment and placement. Boylan, Bliss, and Bonham (1997) have argued that this apparent inconsistency is really a function of a change in the types of students enrolled in remedial courses brought about by mandatory placement. When placement is voluntary a large number of the most poorly prepared students fail to volunteer for or otherwise avoid remedial courses. Although these students are likely to become attrition statistics, they are not counted as such by the remedial program if they are not participants. In essence, voluntary placement tends to prevent a large number of the weakest students from being included in the program's service population.

The students participating in remedial courses under a voluntary placement system, therefore, tend to be more highly motivated or to recognize the need for developing their skills before pursuing curriculum courses. They are also more likely to be successful than less motivated and less realistic students. When placement is mandatory, a higher percentage of academically weaker and less motivated students are taking remedial courses.   These students are among the least likely to be successful in remediation. This contributes to the negative relationship between mandatory placement and student

retention when the results of voluntary placement are compared to the results of mandatory placement (Boylan, Bliss, & Bonham, 1997).

This should not be construed as an argument against mandatory placement. As Cross (1976) points out, fewer than 10% of those needing remediation are likely to survive in college without it. Even though large numbers of the weakest students will become victims of attrition under systems of mandatory placement, more will survive than if they had not received any remediation at all.

Counseling component. Early research also found that successful remedial education programs had a strong counseling component (Roueche & Mink, 1976; Roueche & Snow, 1977). This relationship between an emphasis on personal counseling for students and successful remediation was supported in later research by Keimig (1983), Kulik, Kulik, and Schwalb (1983), Boylan, Bonham, Claxton, and Bliss (1992), the Higher Education Extension Service (1992), and Casazza and Silverman, (1996).

This latter research indicated, however, that counseling in and of itself was not sufficient to impact upon student success. In order for counseling to be successful with remedial students it had to:

(a) be integrated into the overall structure of the remedial program (Kiemig, 1983),

(b) be based on the goals and objectives of the program (Casazza & Silverman, 1996),

(c) be undertaken early in the semester (Kulik, Kulik, & Schwalb, 1983),

(d) be based on sound principles of student development theory (Higher Education Extension Service, 1992), and

(e) be carried out by counselors specifically trained to work with developmental students (Boylan, Bliss, & Bonham, 1997).

Tutoring. The impact of tutoring on remedial students has been widely debated in the literature. Early studies of remediation suggested that tutoring was an important component of successful programs for underprepared students (Roueche & Snow, 1977). Maxwell (1997), however, has argued that research findings on the impact of tutoring on underprepared students have been mixed with no conclusive results being found.

Discussion: Tutoring. Research by MacDonald (1994), Casazza and Silverman (1996), and Boylan, Bliss, and Bonham (1997) helps to clarify this inconsistency. Apparently the effectiveness of tutoring is strongly influenced by the quality and the amount of training received by tutors. This is particularly true when the subjects of tutoring are underprepared students.

Boylan, Bonham, Claxton, and Bliss (1992) found that there was no difference in the performance of students participating in remedial programs whether they received tutoring or not, *unless* the tutoring program included a strong tutor training component. As MacDonald (1994) pointed out, tutors will be ineffective unless they are able to consistently and usefully apply strategies appropriate to each student's situation. This can only be accomplished through training.

Computer-Based Instruction. A substantial amount of research on the effect of computer-based instruction has been conducted in the past decade. In an analysis of computer-based instruction at 123 colleges and universities, Kulik & Kulik (1986)found that the use of the computer as a tutor designed to supplement regular instruction had several positive affects. These included:

(a) more student learning in less time,

(b)slightly higher grades on post-tests, and

(c) improved student attitudes toward learning.

In a later review of research on the use of computers with underprepared students, Kulik & Kulik (1991) found that "computer-based instruction has raised student achievement in numerous settings." (p. 32) Roeuche & Roueche (1999) found that the use of computers for students to do writing assignments and as a tutor in mathematics contributed to the success of remedial courses.

Using data from the National Study of Developmental Education, Bonham (1992), however, found that the effectiveness of computer-based instruction *declined* when it was used as the primary delivery technique in remedial courses. Computer-based instruction appeared to be most successful when it was used as a supplement to regular classroom activities in remedial courses. Where computer-based instruction was used in this, students were more likely to complete remedial courses and to earn higher grades (Bonham, 1992). These findings were later verified in work by Maxwell (1997) and a recent study of remedial programs in Texas (Boylan & Saxon, 1998)

Recent Research on Factors Contributing to Successful Remediation

Classroom/laboratory integration. Research in the past decade has identified several other factors that contribute to successful remedial courses and programs. Boylan, Bliss, and Bonham (1997), for instance, found that integrating classroom and laboratory instruction was associated with student success in remedial courses. When classrooms and laboratories were integrated, instructors and laboratory personnel worked together to insure course objectives were directly supported by laboratory activities. Boylan and Saxon (1998) found that the integration of classroom and laboratory instruction in this manner was also related to student success on a state-mandated achievement test in Texas.

Institution-wide commitment. Roueche and Roueche (1993, 1999) and Roueche and Baker (1987) argued that an institution-wide commitment to remedial education was a key factor in the success of community college remediation. An institution-wide commitment to remediation was reflected through public administrative support for remediation, appropriate allocation of resources for remediation, and institutional acceptance of remediation as a mainstream activity for the community college. In their study of Texas colleges and universities, Boylan and Saxon (1998) found that remedial programs integrated into the academic mainstream of the institution had higher pass rates in remedial courses and were more successful in retaining students than programs that were not thusly integrated.

Consistency of academic standards. Boylan, Bonham, Claxton, and Bliss (1992) found that remedial courses were most effective when regular efforts were made to insure consistency between the exit standards for remediation and the entry standards for curriculum courses. A recent Texas study (Boylan, et. al, 1996), however, found that a surprisingly large number of institutions made no effort to determine if what was taught in remedial courses was actually what was necessary for students to succeed in curriculum courses. At institutions where such consistency was assured, students passing remedial courses had a high likelihood of passing later curriculum courses (Boylan & Bonham, 1992). Roueche and Roueche (1999) also argued for this consistency in their recent recommendations for improving the performance of college remedial programs.

Learning communities and paired courses. The use of learning communities in remedial courses has also been found to improve the performance of students participating in remediation. Learning communities have combined courses and groups of students organized as cohorts. Typically, these cohorts of students took courses linked together by a common theme, and instructors of these courses functioned as a team to insure that the content of each course was related to and supportive of the other courses (Adams & Huneycutt, 1999).

The use of paired courses has offered another example of the learning community concept. A reading course, for instance, might be "paired" with a social science course and students would enroll as a cohort in both courses. The instructors of these two courses would then collaborate to insure that concepts taught in reading related directly to what was being learned in sociology courses (Adams & Huneycutt, 1999).

Tinto (1997) found that underprepared students participating in remedial courses organized around the principles of learning communities had better attitudes toward learning and had higher course completion rates than students in traditional remedial courses. In later research Tinto (1998) found that the use of learning community concepts to teach remedial courses resulted in improved retention for participating students. Commander, Stratton, Callahan, and Smith (1996) found that participating in paired courses improved student performance and resulted in higher levels of reported student satisfaction.

Supplemental Instruction. Supplemental Instruction has also been demonstrated as an effective technique for improving the performance of students in remedial courses. In Supplemental Instruction, a specific course (usually one in which there are high rates of failure) would be supported by supplementary, small-group sessions scheduled as part of the course. These small-group sessions were run by a student leader who attended the course, took notes, and then met with students to hear recitation, give quizzes, discuss course material, and assist students in studying effectively.

Martin and Arendale (1994) cited numerous studies in which students enrolled in courses supported by Supplemental Instruction consistently outperformed students in more traditional courses. Ramirez (1997) cited long-term evidence suggesting that underprepared students who participated in Supplemental Instruction were retained at higher levels than students who had not.

Discussion: Video-based Supplemental Instruction. Of particular note is a recent version of supplemental instruction called video-based supplemental instruction or VSI. Video based supplemental instruction uses videotapes of lectures to support the points made in small-group sessions. This technique is reported to be particularly effective with underprepared students (Martin & Arendale, 1998).

Strategic learning. An emphasis on strategic learning also has contributed to the effectiveness of remedial courses. In the early 1980s, Claire Weinstein argued that underprepared students do not know how to acquire and process information and must, therefore, be taught to monitor their comprehension and think strategically about learning (Weinstein, 1982). In short, remedial students had to learn to recognize when they were not comprehending material and then be able to apply alternative strategies to improve their comprehension. Weinstein and her colleagues expanded these concepts and developed a comprehensive model for teaching underprepared students to think strategically (Weinstein & Rogers, 1985; Weinstein, 1988). When this model for strategic thinking processes was integrated into the remedial curriculum, students became more effective learners, obtained higher grades, and were retained over longer periods of time (Weinstein, Dierking, Husman, Roska, & Powdrill, 1998).

Professional training. Many authors have described the importance of training for those who work with underprepared students (Casazza & Silverman, 1996; Maxwell, 1997; Roueche, 1973). Recent research has validated the need for faculty and staff working with remedial programs to be specifically trained in the techniques, models, and methods appropriate to helping underprepared learners. Boylan, Bonham, Claxton, and Bliss (1992) found that students were more likely to pass remedial courses, earn higher grades, and be retained longer if remedial programs placed a strong emphasis on professional development for faculty and staff. Later analysis of data from this study indicated that the training of staff contributed to increased effectiveness of individual program components such as instruction, counseling, and tutoring as well as to overall program effectiveness (Boylan, Bliss, & Bonham, 1997). The importance of professional training of those working with underprepared students has also been emphasized in the work of Casazza & Silverman (1996) and Maxwell (1997).

Student orientation. Community college remedial programs have recently begun providing organized college orientation seminars for their students. Although the freshmen seminar was initially developed for university students, this concept has since been successfully implemented at many community colleges (Upcraft, & Gardner, 1989). As demonstrated in this research, because community college students were likely to be the first generation of their family to attend college, they tended to be unfamiliar with the expectations and rewards of academe. It should come as no surprise, therefore, that they frequently failed to meet these expectations or to be rewarded in academe. College orientation courses, therefore, were useful tools for helping students learn what was expected of them and assisting them in adjusting to the college environment. Recent research (Gardner, 1998) has shown that underprepared students participating in ongoing orientation courses were much more likely to be retained in the community college than students who did not participate in these courses.

Critical thinking. Remedial students not only have been less likely than others to understand the expectations and rewards of college, they also have been less likely to understand the types of thinking required for success in college courses. The emphasis of critical thinking throughout the remedial curriculum has proven successful in improving the performance of underprepared students. The work of Chaffee (1992) and his colleagues teaching critical thinking at La Guardia Community College has been particularly impressive in its impact on underprepared students. Participation in courses, programs, and activities designed to enhance critical thinking has improved students performance in reading and writing (Chaffee, 1992; St. Clair, 1994-95), improved students' attitudes toward learning (Harris & Eleser, 1997), and contributed to higher grade point averages and retention (Chaffee, 1998).

Summary and Conclusions

Thirty years of research has provided us with a great deal of information on how to deliver remediation effectively. There is, as a result of this research, a rather substantial body of knowledge to guide the practice of those who work with underprepared students on community college campuses. We can say with some certainty that the following techniques, models, or structures contribute to successful remediation.

- The establishment of clearly specified goals and objectives for developmental programs and courses.

- The use of mastery learning techniques in remedial courses.

- The provision of a high degree of structure in remedial courses.

- The use of a variety of approaches and methods in remedial instruction.

- The application of sound cognitive theory in the design and delivery of remedial courses.

- The provision of a centralized or highly coordinated remedial program.

- The use of formative evaluation to guide program development and improvement.

- The establishment of a strong philosophy of learning to develop program goals and objectives and to deliver program services.

- The implementation of mandatory assessment and placement.

- The provision of a counseling component integrated into the structure of remedial education.

- The provision of tutoring performed by well-trained tutors.

- The integration of classroom and laboratory activities.

- The establishment of an institution-wide commitment to remediation.

- The assurance of consistency between exit standards for remedial courses and entry standards for the regular curriculum.

- The use of learning communities in remedial instruction.

- The use of Supplemental Instruction, particularly video-based Supplemental Instruction to support remedial courses.

- The provision of courses or workshops on strategic thinking.

- The provision of staff training and professional development for those who work with underprepared students.

- The provision of ongoing student orientation courses.

- The integration of critical thinking into the remedial curriculum.

It is interesting to note that although this body of knowledge has been available it has not been widely used by practitioners. The authors' observations from statewide studies of remedial education in Mississippi, South Carolina, North Carolina, and Texas suggest that fewer than half of the faculty teaching remedial courses are trained to do so or use the literature of the field to guide their practice. Providing effective remediation is not a mysterious proposition. We know how to do it. We simply do not use what we know.

As Chuck Claxton (1992) has pointed out, "Bad remediation costs about as much as good remediation." By failing to use what we already know to improve what we do, we insure that we get the least value for our investment in remediation.

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