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ABSTRACT

This paper presents a focused case study of Ann and Kay, a team of exemplary elementary teachers, as they worked to modify their mathematics instruction to be consistent with the goals of the Kentucky Education Reform Act and Kentucky Instructional Results Information System (KIRIS), its innovative high-stakes assessment system. At the time of the study, the mathematics component of KIRIS included three types of measures: open response items, multiple choice items, and mathematics portfolios (in a research and development phase), which together assessed students' understanding of concepts and procedures, as well as their ability to use this understanding to solve problems in other disciplines and real life. Teacher efforts to guide students' creation of mathematics portfolios and prepare them for the open response item format focused on increased attention to problem solving, mathematical communication, and connections to real world situations. They often found themselves faced with tensions and struggles as they attempted to put policy into practice without compromising their pedagogical goals and beliefs. In this case study, how the teachers worked with these tensions to create a successful reform-based mathematics program in their 4-5 classroom is discussed. (SLD)

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CSE Technical Report 495

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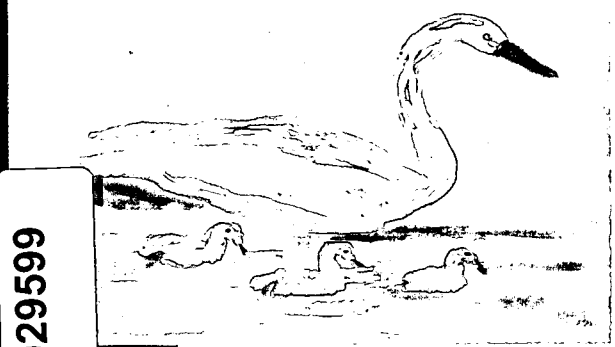

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TENSIONS BETWEEN COMPETING PEDAGOGICAL AND ACCOUNTABILITY COMMITMENTS FOR EXEMPLARY TEACHERS OF MATHEMATICS IN KENTUCKY[1]

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Abstract

This paper presents a focused case study of Ann and Kay, a team of exemplary elementary teachers, as they worked to modify their mathematics instruction to be consistent with the goals of the Kentucky Education Reform Act (KERA) and Kentucky Instructional Results Information System (KIRIS, its innovative high-stakes assessment system). At the time of our work with Ann and Kay, the mathematics component of KIRIS included three types of measures: open response items, multiple choice items, and mathematics portfolios (in a research and development phase), which together assessed students' understanding of concepts and procedures, as well as their ability to use this understanding to solve problems in other disciplines and real life. Ann and Kay's efforts to guide students' creation of mathematics portfolios and prepare them for the open response item format focused on increased attention to problem solving, mathematical communication, and connections to real world situations. They often found themselves faced with tensions and struggles as they attempted to put policy into practice without compromising their pedagogical goals and beliefs. In this case study, we discuss how they worked with these tensions to create a successful reform-based mathematics program in their 4-5 classroom.

[1] We would like to thank other members of the research team: Shelby Wolf, Monette McIver, Brian Stecher, and Sheila Barron, for their comments on the paper. We extend special thanks to the two teachers whose story is presented in the paper. These teachers opened their classroom to us and spent many hours sharing their ideas about teaching and learning with us. Without their support, this project would not have been possible. An earlier version of this paper was presented at the CCSSO National Conference on Large Scale Assessment, Colorado Springs, June 1998.

Introduction

For the past five years, Ann and Kay,[2] a team of exemplary elementary teachers in an urban Kentucky school district, have worked hard to modify their mathematics instruction to be consistent with the goals of the Kentucky Education Reform Act (KERA). Like many other teachers in the state, their efforts focused on increased attention to problem solving, mathematical communication, and connections to real world situations. The change process has not been an easy one for these two teachers; they often found themselves faced with tensions and struggles as they attempted to put policy into practice without compromising their pedagogical goals and beliefs. This paper is, in part, the story of how Ann and Kay worked with these tensions to create a successful reform-based mathematics program in their 4-5 classroom.

Ann, Kay, and other dedicated teachers were not the only ones who struggled to make KERA work. The Kentucky Department of Education (KDE) was responsible for operationalizing KERA and determining schools' success in attaining its goals. Like Ann and Kay, KDE personnel committed to the reform vision embodied in KERA found themselves faced with tensions and struggles as they worked to create a measurement and accountability system that would assess school performance against Kentucky's six broad learner goals, while meeting the psychometric requirements for a high-stakes assessment system. This paper is also, in part, the story of their efforts.

Finally, this paper is the story of the Kentucky political system that ultimately took these struggles out of the hands of educators by mandating a new Commonwealth Accountability and Testing System (CATS) to replace KIRIS beginning in the 1998-99 school year. This paper focuses primarily on mathematics portfolios, as many of the conflicts of the educational reform were fought on the battleground of mathematics portfolio assessment.

KERA, KIRIS, and Mathematics Portfolios

KIRIS is Kentucky's innovative, high-stakes assessment system. The mathematics component of KIRIS was designed to assess students' mathematical

[2] Ann and Kay are pseudonyms.

literacy: their understanding of concepts and procedures, as well as their ability to use this understanding to solve problems in other disciplines and in real life (KDE, 1995a). It consisted of three types of assessments, whose status in the Accountability Index fluctuated over the years.

- Open response items, consistently part of the Accountability Index, provided the opportunity for students to demonstrate their ability to apply skills and show understanding of concepts.

- Multiple choice items tested both computational and problem-solving skills. They were part of original KIRIS testing, dropped, and then reintroduced in 1996-1997; to be included in the Cycle 4 Accountability Index.

- Mathematics portfolios were designed to assess students' comprehensive understanding of mathematics and mathematical processes. They were included in the Accountability Index through the 1995-1996 testing cycle.

KDE had high expectations for the role of portfolios in KERA. From the beginning, they were to serve dual purposes: to provide measures of student achievement for the accountability system and to encourage changes in curriculum and instruction. Thus, "The mathematics portfolio must become the foundation upon which the instructional program is built. It is not and must not be an add-on to the instructional program" (KDE, 1995b, p. ii). When used as envisioned,

> Quality portfolio assessment makes it possible for teachers to identify accurately the learning needs of individual students and student groups, to review the appropriateness of curriculum goals and content, and to evaluate the quality of their own teaching. In effective learning environments, assessment and instruction are inexorably linked. (KDE, 1997a, p. 22)

Despite this central role, mathematics portfolios were removed from the Accountability Index in Fall 1996 because of concerns such as reliability of scoring and lack of standardization in the way portfolio entries were produced. KDE began a three year research and development (R&D) effort to address these concerns. Selected teachers worked with KDE, with the goal of reintroducing portfolios into the Accountability Index in 2000-2001. Key changes considered during the R&D phases included:

- promoting more concisely written portfolio entries that emphasize mathematical representations (e.g., models, charts, graphs, symbols) with shorter verbal explanations embedded around the representations;

- field testing common sample tasks provided by KDE; and
- experimenting with various scoring options and associated guidelines.

To address concerns about lack of standardization, KDE developed a written document containing Philosophical Guidelines/Code of Ethics for preparation of mathematics portfolios and made these guidelines the focus of the 1998 Spring Math Portfolio Training offered to teacher leaders throughout the state. These guidelines stressed student ownership of portfolio work:

> Students must have total ownership of their mathematics. Any intervention from teachers, peers and/or others should enhance rather than remove or diminish that ownership. ... At no time should students' ideas, revisions, or editing be characterized as teacher-authored, peer-authored, or parent-authored. (KDE, 1997a, p. 22)

Further, during the portfolio preparation process,

> Feedback should be given to the students whenever the teacher feels it is appropriate. Feedback occurs by conferencing with students individually, group conferences, peer reviews, and post-it-notes. It is essential, however, that during these conferences the student retain ownership of his/her work. Teachers and/or others will not at any time actually solve the problem on portfolio entries, do the mathematics or do the writing. The teacher will support the student in self-assessing and making final decisions; however, the student will decide what to incorporate and what to reject. (KDE, 1997a, p. 24)

Throughout the R&D phase, KDE personnel remained convinced of the value of portfolios and committed to having them continue to serve the dual purposes for which they were designed. They engaged in tremendous efforts to address the concerns expressed by measurement specialists as well as some teachers throughout the state. Their efforts were supported by teachers such as Ann and Kay.

KERA's Impact on Mathematics Instruction

Ann and Kay are exemplary teachers who have a strong commitment to the goals of KERA and KIRIS. And, they are teaching at a school that has embraced these goals. Each summer for the past several years, the school's curriculum committee has taken on the task of revising its curriculum for one subject area, to align it with the appropriate component of *Transformations: Kentucky's Curriculum Framework*. The mathematics curriculum was revised in Summer 1996. As Ann

explained, now that the curriculum was realigned "to the state guidelines and to the NCTM guidelines, ... we have a much tighter, more comprehensive math program."

For Ann and Kay, this revamping of the mathematics curriculum was accompanied by substantial changes in their mathematics teaching. To teach toward KERA goals,

> We had to devote a lot of time to talking about math and talking about solving problems and solving problems in different ways. ... I'd say our computation instruction is maybe 20, 30% of what we do, whereas before, it was expected to be about 80% of what we did. So that's flipped completely.

As a result of these changes in their mathematics program and associated changes in their expectations for students, Ann and Kay believe that their students have a better understanding of mathematics than they did in the past.

> Our kids are better mathematicians because we're listening to what they have to say instead of just grading the numbers on a page. I see a lot of kids that have some strengths in math that just 20 computation problems would not pick up.

Their school's 1997 KIRIS scores support this positive assessment. The school met its goal for an overall KIRIS score and was classified as "successful" according to the state's performance criteria. Further, their mathematics score increased approximately 10 points between 1996 and 1997.

The Dilemma of Hands-On Instruction and Hands-Off Accountability

The road to success has not been an easy one for Ann and Kay. Although strong supporters of KERA and its educational policies and practices, they sometimes found themselves facing serious challenges as they attempted to revamp their mathematics instructional program. Most problematic were the dilemmas they confronted when their pedagogical goals and beliefs conflicted with the requirements of KIRIS testing. These dilemmas occurred primarily with mathematics portfolios—the only component of the KIRIS mathematics testing that was completed during teachers' ongoing instructional programs.

Although portfolios were not included in the KIRIS Accountability Index for the 1996-1997 and 1997-1998 testing cycles, Ann and Kay (along with the other 4-5 teachers at their school) continued to treat them as an integral part of their

mathematics program. And, they continued having their students prepare portfolios according to the KIRIS guidelines.

At the same time, Ann and Kay believed strongly that their students needed substantial assistance to learn the mathematics content and processes needed to put together high quality portfolio entries. It was in attempting to provide this assistance, while still ensuring that students complete a sufficient number of independent portfolio entries to meet the accountability requirements that their pedagogical beliefs came into conflicts with KIRIS. As Ann explained,

> ... you really want the kids' independent work [portfolio entries] to be the ones in the assessment portfolio. But you've got to train them. You've got to model them. You've got to go through the whole thing with them or they'll never be able to do it on their own ... not to the state standard, anyway.

We saw many instances of the outstanding scaffolding that Ann and Kay provided to their students during our three visits to their classroom. Some of the strongest examples occurred during Daily Oral Mathematics (DOM), when they used open response type tasks to help students learn to use appropriate problem solving strategies and to write mathematical explanations to accompany their problem solutions.

"Hands-On" Scaffolding of a DOM Activity

In our Fall 1997 visit, Ann and Kay worked with the fourth-grade students and then with the fifth graders on DOM tasks. They separated the groups so that they could provide more structure and modeling for the fourth graders. As Ann explained, with fourth graders, "we really try to scaffold that experience because ... a lot of them have never done any (open-ended problem solving tasks). They don't have a clue what strategies are. ... So we spend a lot of the fourth-grade year modeling it. With fifth graders, we like to turn them more loose; they need to be doing it more independently."

Fourth graders worked with the following prompt:

> Make a word problem that has 42 as its solution.
>
> Explain how someone could solve the problem.

Ann introduced the problem to the students by paraphrasing it and providing fairly specific instructions about what to do. She emphasized: "Is there one right answer? No, there are probably at least a million ways to do the problem. Choose one way, and write a problem. Then you have to explain how someone would solve the problem." Ann then told the students to take out their papers with guidelines for Open Response and Portfolio task write-ups. She set the timer for 4 minutes and the students began working. As students worked, Ann and Kay walked around the room, looking at their papers but not providing assistance. After a couple of minutes Kay walked over to the area of the classroom where the fifth-grade students were working.

When the timer went off, Ann asked how many students needed more time. Virtually every student put up a hand, and she set the timer for an additional 4 minutes. When it went off for the second time, Ann and Kay discussed the problem with the students. They asked several students to share their answers and focused the conversation primarily on the strategies they used, what counts as a good strategy, and their use of good mathematical language.

For example, Ann asked someone to tell what strategy they used.

Student: Guess-and-check

Ann: How did you use guess-and-check?

Student: I guessed first and then checked with addition.

Kay: What strategy did you use to get the word problem?

Student did not respond.

Ann: Read me your word problem.

Student: 46-4=42.

Ann: You did a wonderful restatement. I know just what strategy you used. Look at our list. What strategy did you use?

Student: Writing an equation.

Ann: Writing an equation with what in it?

Student did not respond.

Ann: Not addition.

Student: Subtraction.

Ann: That's a good strategy, but it's not guess-and-check.

After the discussion, Ann put up another overhead with the rubric for scoring open response tasks. She asked the students to take out their red pens to self-evaluate. They then had several minutes to finish or revise their work based on the discussion and to evaluate their completed response using the rubric as a guide. They handed in their work so that Ann and Kay could evaluate and score it before returning it to them on the next day. The activity took just over 20 minutes.

This instance of instruction during Daily Oral Mathematics illustrates the multi-faceted approach that Ann and Kay used to guide and scaffold students' ability to work independently on mathematics problems. It also highlights several ways in which these two exemplary teachers attempted to teach toward the goals of KERA and KIRIS. Both teachers mentioned repeatedly the importance of helping students learn to think, to structure their time, and to take risks in their mathematical work. They explained their use of the timer to help students learn to structure their time: "Our biggest problem is getting them in a time frame. ... They always want extra time. ... especially kids who are afraid to think." So, to make them more aware of time "We'll get them started. We'll set it for 4 minutes. ...There's a lot of fear so a lot of times they'll sit there for 4 minutes and then we set it for 4 more." They also talked about how difficult it was for them to keep quiet and allow students to work independently. Their natural tendency was to provide even more coaching than they did. Indeed, they joked with each other and with us about having to leave the room, put tape on each other's mouths, and take other draconian measures to keep quiet as they watched students struggle to complete these tasks at the beginning of the year.

"Hands-Off" Accountability for Portfolio Tasks

Ann and Kay see portfolios as valuable pedagogical tools, and they have incorporated them into their ongoing instructional program. They use at least one portfolio activity within each mathematics unit, most often as an assessment at the end of the unit. However, they struggle with the question of how to use prompts in a way that is pedagogically sound and will result in completed portfolios that meet KIRIS guidelines by the end of the school year. Their struggles center on two issues—the nature of the prompts and the scaffolding of the task.

Ann and Kay agree with the KDE guidelines regarding characteristics of appropriate tasks for mathematics portfolio assessment: that they can be approached in multiple ways, require more than an algorithmic solution strategy, allow students to select and apply a strategy of their choice, require grade-level mathematics, and provide a meaningful context to apply skills or concepts (KDE, 1997b). However, in their experience, students are not ready to work on tasks with these characteristics at the beginning of the school year. Thus, when we visited their classroom in September 1997 they had just used a portfolio task at the end of the Numeration/Computation unit which was, in their estimation, "very weak," focusing more on computation than conceptual understanding or problem solving. As Ann explained,

> This is where they are right now and if you want to give them something that's way beyond them, number one you're wasting your time and number two you're going to lead them to places they're not ready to go.

Similarly, students are not ready to work independently on portfolio tasks at the beginning of the year. They need a lot of "directed, scaffolded training." As part of this training Ann and Kay provide students with a template specifying components of a written portfolio response and guide students through drafting the components, one at a time. As Ann explained,

> When we started them at the beginning of the year, we would write out a template. ... We'd give them very clear direction on what a written response would look like. ... [Then] we would say, "You do an introduction. I'm going to set the timer for about 5 minutes. Give me what you think is a good introduction." And then, when the timer went off, we'd say, "Would anybody like to read what they've got?" Then the children would read some of the things that they [wrote] and we can either say "that's great" or "you're on the right track." And the other kids would benefit from that. So we're doing a lot of directed instruction.

Ann and Kay understand well that portfolio tasks scaffolded in this way cannot be included in students' assessment portfolios. They "can go in their working portfolio. But when it comes down to it, we have to have [students] choose their most independent work. Even if they wanted to choose something that we had orchestrated to that degree together, I wouldn't feel comfortable about putting it in an assessment portfolio."

For their class of 1998, Ann estimated that "it's going to take us to January, December, before we can get kids to really do the types of things we'd like them to be able to do as a fifth grader on a math portfolio." However, given the KDE requirement for six entries in a student's mathematics portfolio, Ann and Kay felt they did not have until December or January to teach through modeling, scaffolding, and providing feedback. Instead, students needed to begin working independently on their mathematics portfolios much earlier in the school year. Hence, they faced a dilemma as they attempted to use portfolios in a way that was pedagogically sound but did not violate guidelines of student ownership.

With portfolios in a R&D phase, Ann and Kay were able to postpone confronting this dilemma head on. The fact that portfolios were not part of the Accountability Index "allows you to be a little more flexible and creative. And it's allowed us to do more modeling, which the kids really benefited from." As a result, Ann reported in Spring 1997,

> I feel really good about the portfolio process that we've had in math throughout the school year. I think that having the scaffolded activities and lessons and some of the direct feedback we've given them in their writing will help them now that they're in the more independent stage.

Ann and Kay have not resolved this dilemma, and they continue to wonder whether portfolios can serve both pedagogical and accountability purposes. Thus, in Fall 1998 Ann ruminated, "Is this an instructional tool or is this an assessment tool? I think there's still a real big question in my mind as to whether it should be both." They believe, first and foremost, that portfolios should be an instructional tool, even if that means keeping them out of the Accountability Index. On the other hand, they would like to see portfolios be reinstated in the Accountability Index to ensure their continued place in teachers' mathematics programs.

KDE's Continuing Challenges to Address Portfolio Concerns

Just as Ann and Kay found no easy resolution to their "hands-on, hands-off dilemma," KDE personnel did not discover an easy solution to the challenges surrounding the mathematics portfolio assessments. They continued to work hard at addressing these challenges. Their efforts included the development of materials such as booklets of sample portfolio tasks for elementary, middle, and high school levels; pamphlets providing guidance in selecting appropriate tasks at each of these

levels; and *Analytic Piece Scoring Guides for Grades 5, 8, and 12*. They conducted a series of training sessions focused on characteristics of appropriate portfolio tasks, using the new scoring guide and ethical considerations in portfolio scoring, for teacher leaders throughout the state in Fall 1997 and Spring 1998. In addition, they planned a Summer 1998 working session for the Mathematics Portfolio Advisory Group, to score a sample of mathematics portfolios at all levels and to develop materials for distribution to teachers across the state. These materials will include sample tasks, scoring guides, and benchmark portfolio entries at all levels.

KDE personnel felt confident that they were making good progress on a number of fronts. For example, based on their work with teachers using the *Analytic Piece Scoring Guide* at the Fall 1997 and Spring 1998 Mathematics Portfolio Training Sessions, they felt that teachers were becoming more consistent in their scoring of portfolios. Also, based on their initial review of the mathematics portfolios submitted to be scored at the summer meeting they were very encouraged by the quality of the portfolio entries.

The Kentucky General Assembly Takes Mathematics Portfolios Out of Educators' Hands

Despite the efforts of KDE and many Kentucky teachers, the General Assembly passed House Bill 53 at its 1998 Regular Session, effectively taking decisions about mathematics portfolios out of educators' hands. House Bill 53 mandates major changes in Kentucky's assessment and accountability system. A new Commonwealth Accountability and Testing System (CATS) will replace KIRIS beginning in the 1998-99 school year. KIRIS was administered as designed in 1997-98, and data will be used to compute school scores for the third (and final) Accountability Cycle. The new Assessment and Accountability System will be in place for the 1998-99 school year, with baseline data collected in 1998-99 and 1999-2000, and the first accountability determination to be made after the 2000-2001 and 2001-2002 school years.

House Bill 53 mandates that CATS will include:

- Open response or multiple-choice items, or both, to assess student skills in reading, mathematics, science, social studies, the arts, the humanities, and practical living and vocational studies;
- An on demand assessment of writing;

- Writing portfolios consisting of samples of student work; and
- Performance assessment events for schools that have students enrolled in competitive performing arts programs.

There is no mention of mathematics portfolios in the new legislation. The superintendent's office has indicated, however, that mathematics portfolios will not be part of the new testing system.

Post-Script

Ann and Kay are disappointed that mathematics portfolios will not be part of the new Commonwealth Accountability Testing System. They intend to continue including portfolios in their mathematics program. However, they are not optimistic about the future of these innovative instructional and assessment tools. As Ann indicated in our final interview:

> Now they've come out and said they don't want math as part of the assessment. I'm really uncomfortable with that, because ... teachers aren't going to do it [keep portfolios in their mathematics programs]. There's no accountability. If there's no accountability, it's not going to happen.

We found ourselves watching the demise of KIRIS with great interest. Although certainly far from perfect, KIRIS was viewed nationally as perhaps the most innovative state assessment system. As noted in *Education Week* (September 2, 1997), "KIRIS has been lauded for its use of performance assessments in which students must show what they know. It has also been controversial inside and outside the state...." Kentucky put enormous resources into developing and administering the assessment system, and into professional development opportunities for teachers. And KDE involved exemplary teachers like Ann and Kay in many aspects of its ongoing work to improve KIRIS and assist teachers in its implementation. Yet, these efforts were not enough, and some of the most innovative elements of KIRIS will be conspicuously absent from CATS. We are left wondering whether Ann is right that changes in classroom practice will disappear. We also wonder what it takes to make innovations like KIRIS work. Or is House right when he notes that "Teachers know from experience that reformers cannot guarantee the promised outcomes of their reforms.... Most reforms are the simple ideas of political and educational entrepreneurs. Almost all become fads, only to disappear eventually.... Why bother?" (House, 1996, pp. 8-9).

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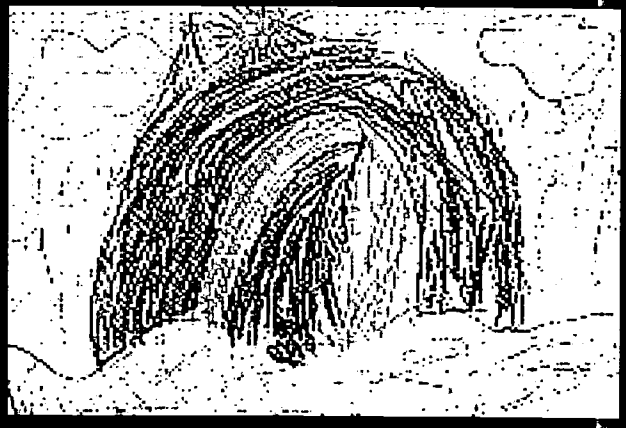

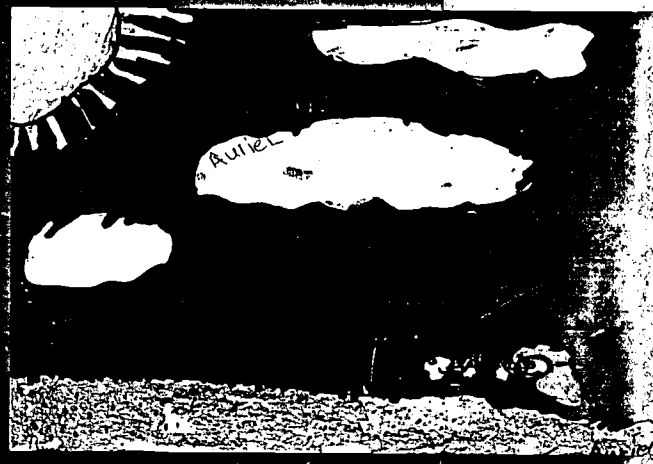

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