

The Impact of a Natural Disaster on Classroom Curricula

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ABSTRACT: This study examines classroom curricula and activities in the academic year subsequent to a flooding disaster that led to school being canceled five weeks before the usual end of the academic year. Fifty-seven elementary school teachers from five schools provided information regarding alterations they made in their curriculum in the academic year subsequent to the flood. Curricular adjustments took the form of additional review of information from the previous academic year and integration of flood-related information into classroom curricula. Curricular adjustments made by teachers were found to vary as a function of the grade taught. Teachers in the earliest grades made more alterations in their reading, writing, and expressive language instruction as compared to teachers in the more advanced grades. Teachers in the more advanced grades made more alterations in mathematics instruction than teachers in the earliest grades. Specific ways in which teachers included information regarding the flood into their curriculum included discussion, reading stories, drawing pictures, and writing essays and books on topics which related to floods. It is important to note that these post-disaster interventions were unplanned; individual classroom teachers made decisions about if and how they would make alterations in their curriculum in the wake of the disaster the previous year. School districts may find it advantageous to develop contingency plans in the event that a disaster or another significantly disruptive event does occur. We also recommend that school districts more carefully document post-disaster educational experiences of their students, within and outside of the school district, in order to learn

more about what types of academic interventions are most helpful to students after the occurrence of disasters.

RÉSUMÉ: Cette étude scrute les programmes scolaires et les activités durant l'année académique qui a suivi l'inondation, laquelle entraîna l'annulation des cours durant les cinq semaines précédant la fin normale de l'année académique. Cinquante-sept enseignants de l'élémentaire provenant de cinq écoles ont fourni les informations concernant les changements apportés au programme scolaire dans l'année qui suivit l'inondation. Les rajustements ont pris la forme d'une révision additionnelle des contenus de l'année académique précédente et d'une intégration, à l'intérieur du programme, d'éléments relatifs à l'inondation. Ces modifications, faites par les enseignants, étaient différentes selon les degrés enseignés. Les enseignants des premiers degrés ont fait plus de changements dans leurs leçons de lecture, d'écriture et d'expression orale, comparativement aux enseignants des degrés plus avancés. Ces derniers ont fait plus de modifications en mathématique que les enseignants précédents. Les manières spécifiques, selon lesquelles les enseignants ont inclus les éléments concernant l'inondation dans leur programme, sont la discussion des sujets, la lecture d'histoires, les dessins et l'écriture d'essais et de récits sur des thèmes relatifs aux inondations. Il est important de noter que ces interventions «après désastre» n'étaient pas planifiées; les enseignants individuellement ont pris les décisions, à savoir si et comment ils feraient les changements dans leur programme, étant donné le désastre de l'année précédente. Les autorités scolaires peuvent trouver cela avantageux pour développer des plans d'urgence dans l'éventualité d'un nouveau désastre ou autre événement destructeur important. Nous recommandons aussi que les autorités scolaires se documentent plus soigneusement au sujet des expériences éducatives «après désastre» de leurs étudiants, que ce soit à l'intérieur ou à l'extérieur du district scolaire. Ceci, afin d'apprendre davantage au sujet des types d'interventions académiques les plus aidantes pour les étudiants après l'arrivée d'événements désastreux.

Natural disasters such as the San Francisco earthquake and Hurricane Hugo in 1989, and Hurricane Andrew in 1992, affected thousands and disrupted the way of life for many American families. Much research has been dedicated to the emotional needs and posttraumatic stress disorder symptoms of children and adults affected by these and other natural disasters (Bradburn, 1991; La Greca, Silverman, Vernberg & Prinstein, 1996; Saylor, Swenson, & Powell, 1992). Relatively few studies have examined the educational needs of children involved in such disasters. The extant literature suggests, however, that children's academic performance may be negatively impacted by disasters (Gleser, Green, & Winget, 1981; Milne, 1977; Yule, 1992). Concentration difficulties are not uncommon in children subsequent to disasters; these concentration difficulties may lead to impaired school performance in children after a disaster (Udwin, 1993; Vernberg & Vogel, 1993). Moreover, disasters disrupt or discontinue school, and often result in inadequate presentation or complete omission of some classroom material.

Several researchers (Prinstein, LaGreca, Vernberg, & Silverman, 1996; Seroka, Knapp, Knight, Siemon, & Starbuck, 1986; Udwin, 1993; Vernberg & Vogel, 1993) describe post-disaster interventions that have been conducted in elementary school classrooms. The majority of these intervention strategies, however, have been aimed at improving children's emotional functioning subsequent to the disaster. For example, Vernberg and Vogel (1993) suggest techniques such as role-playing, free-verse poetry and stories, large-group discussions, and special class projects for facilitating expression and discussion of disaster experiences. Although it would be expected that children will also have special academic needs subsequent to a disaster, there is little suggestion in the literature on what should be done in order to compensate for disrupted educational programs. Only Klingman (1988) directly discusses the need for teachers to assist students in regaining academic competencies after a disaster. Since academic cohesiveness and the length of the school day and calendar are issues of concern for educators (Frazier & Morrison, 1998; Orellana & Thorne, 1998), it is surprising that there is so little research regarding children's return to the school environment after disasters.

One may expect variability in teachers' remediation strategies and methods of including disaster experiences into their curriculum depending upon the age of the children in their classroom (Doll, 1992; Krogh, 1997; Rich, 1992; Webb, 1980). In earlier grades when instruction in academic skills (e.g., reading, writing, arithmetic) is just beginning, academic remediation subsequent to a significant disruption in the academic year may need to be more extensive than in later grades. Similarly, the type of disaster-related activities teachers choose to include in their curriculum subsequent to a disaster are likely to vary depending upon the age of the children in the classroom. For example, one might be more likely to see disaster-related artwork, songs, and stories in classrooms serving relatively young children, and disaster-related independent writing assignments in classrooms with older children.

The 1997 Red River Valley Flood had a great impact on adults and children alike, devastating the community of Grand Forks, North Dakota. The flooding disaster began in Grand Forks on April 18, 1997. During the disaster, approximately 40,000 people (80% of residents) were evacuated from Grand Forks. Approximately 75% of the homes in Grand Forks were impacted by the flooding. Not surprisingly, many schools in Grand Forks were also affected by the flooding. Due to the flood, school was canceled for the remainder of the academic year (i.e., five weeks before the usual ending of the academic year). Of the 11 public and four parochial elementary schools in Grand Forks, 10 schools sustained substantial damages. Two elementary schools were destroyed completely, while the other eight impacted schools had main-floor damage due to the flooding. This main-floor damage not only damaged facilities but also destroyed books, lesson plans, supplies, and other teaching materials from previous years.

The present study examines classroom curricula and activities in five Grand Forks elementary schools (four public, one parochial) in the academic year subsequent to the flood. The five schools chosen for inclusion in this study varied in terms of the damages they sustained due to the flood. One school was undamaged due to the flood. Three schools sustained significant

damage (e.g., lower-level classrooms, library, computer laboratory, cafeteria, gymnasium). The fifth school was destroyed completely in the flood; school took place in relocatable trailers during the entire 1997-1998 academic year.

Method

Participants

Fifty-seven classroom teachers from five elementary schools in Grand Forks participated in the study. Teachers were distributed by grade as follows: 10.5% kindergarten, 12.3% first grade, 1.8% first/second grade, 14.1% second grade, 17.5% third grade, 15.8% fourth grade, 10.5% fifth grade, and 17.5% sixth grade. All participants had been teachers during the previous spring's flood.

Procedure

Participants completed a 13-item questionnaire which assessed alterations in classroom curricula in the ten months subsequent to the flood (i.e., September - February of the academic year subsequent to the flood). For the present study, participants were asked through both forced-choice and open-ended questions to provide information regarding specific curricular alterations that were made in the first six months of the academic year. Participants were also asked to indicate how much time they were spending each week in classroom activities related to the flood, and to describe any ways in which flood-related topics had been integrated into their curriculum. Participants were asked to provide general ratings of their students' academic adjustment (i.e., using a Likert scale) and to describe their students' academic functioning as compared to that of the students the teacher instructed the previous year (i.e., "As compared to children's academic functioning last year, how well do you think the children in your class this year are functioning?"). Students' level of academic adjustment was rated on a scale of 1-7. A score of 1 referred to a very low level of adjustment, whereas a score of 7 referred to a very high level of adjustment. Academic functioning of current students as compared to the previous year's students was assessed on a scale from -2 to 2, with a score of -2 referring to "much worse" and a score of 2 referring to "much

better." Finally, teachers were asked to indicate if they believed that they had a role in helping students to cope with the disaster experience and to discuss what they considered their specific role to be.

Results

Questionnaire data revealed that 79% of teachers indicated that they had altered their curriculum as a result of the flood. Specific findings include the following: 67% percent reported curricular alterations in mathematics instruction; 25% reported alterations in reading instruction; 14% reported alterations in writing instruction; 14% reported alterations in expressive language instruction, and 12% reported alterations in other curricular areas (e.g., music, art, social studies). As many teachers made changes in more than one area, the above percentages add up to more than 79%. Curricular changes in content areas most often took the form of additional review of information taught the previous year, slower introduction of new material, and development of new materials lost in the flood.

Data were analyzed separately by grade groups in order to assess variability in curricular changes across grades. The data from the kindergarten, first-, and second-grade teachers were consolidated into one group ($n = 22$), as were the data from the third-grade and fourth-grade teachers ($n = 19$) and that of the fifth- and sixth-grade teachers ($n = 16$). Data regarding curricular alterations in academic subjects (e.g., mathematics, reading) for each of the three grade groups are presented in Table 1. Chi-Square analyses were conducted to assess for significant differences across the three grade groups in terms of curricular alterations made. The results of these analyses are presented in Table 2.

Table 1. Percentage of Teachers Making Curricular Alterations

Curriculum Area	Grade Level		
	K-2	3-4	5-6
Any Changes in Curriculum	73	79	88
Mathematics	41	79	88
Reading	50	16	0
Writing	32	5	0
Expressive Language	32	5	0
Other Curricular Area	27	5	0

Table 2. Results of Chi-Square Analyses Assessing for Significant Differences across the Three Grade Groups in Terms of Specific Curricular Alterations Made

Area of Instruction	Group 1 vs. 2		Group 1 vs. 3		Group 2 vs. 3	
	<u>n</u>	χ^2	<u>n</u>	χ^2	<u>n</u>	χ^2
Mathematics	38	8.31 ^a	36	9.66 ^b	32	.24 ^c
Reading	38	4.87 ^d	36	11.31 ^e	32	2.92 ^c
Writing	38	4.26 ^f	36	6.21 ^g	32	.91 ^c
Expressive Language	38	4.26 ^f	36	6.21 ^g	32	.91 ^c
Other Curricular Areas	38	3.22 ^c	36	5.14 ^h	32	.91 ^c

Note. Group 1 vs. 2 refers to grades K-2 versus grades 3-4. Group 1 vs. 3 refers to grades K-2 versus grades 5-6. Group 2 vs. 3 refers to grades 3-4 versus grades 5-6. ^a $p < .004$. ^b $p < .002$. ^c $p > .05$. ^d $p < .028$. ^e $p < .001$. ^f $p < .04$. ^g $p < .013$. ^h $p < .024$.

There were no significant differences across the three groups in the proportion of teachers who reported making any type of curricular alterations (all p s $> .68$). Analyses did reveal, however, differences across the grade groups in the specific curricular alterations made. Chi-Square revealed a significant difference between the earliest grade group and the middle grade group in the proportion of teachers who made curricular alterations in mathematics instruction, with significantly more changes made

in the middle grade group as compared to the earliest grade group. A significant difference was also found between the earliest age group and the most advanced grade group in the proportion of teachers who made mathematics curricular alterations, with significantly more changes made in the most advanced grade group as compared to the earliest grade group. The difference between the middle grade group and the most advanced grade group was not statistically significant.

Significant differences were also found between the grade groups in terms of curricular alterations in reading instruction. Chi-Square revealed a significant difference between the earliest grade group and the middle grade group in the proportion of teachers who made curricular alterations in reading instruction, with significantly more changes made in the earliest grade group as compared to the middle grade group. A significant difference was also found between the earliest age group and the most advanced grade group in the proportion of teachers who made curricular alterations in reading instruction, with significantly more changes made in the earliest grade group as compared to the most advanced grade group. The difference between the middle grade group and the most advanced grade group approached significance.

A significant difference was also found between the earliest grade group and the middle grade group in the proportion of teachers who made curricular alterations in writing instruction, with significantly more changes made in the earliest grade group as compared to the middle grade group. A significant difference was also found between the earliest age group and the most advanced grade group in the proportion of teachers who made curricular alterations in writing instruction, with significantly more changes made in the earliest grade group as compared to the most advanced grade group. The difference between the middle grade group and the most advanced grade group was not statistically significant.

Regarding curricular alterations in expressive language instruction, significant differences were found between the earliest grade group and the two more advanced grade groups. A significant difference was found between the earliest grade group

and the middle grade group in the proportion of teachers who made curricular alterations in expressive language instruction, with significantly more changes made in the earliest grade group as compared to the middle grade group. A significant difference was also found between the earliest age group and the most advanced grade group in the proportion of teachers who made curricular alterations in expressive language instruction, with significantly more changes made in the earliest grade group as compared to the most advanced grade group. The difference between the middle grade group and the most advanced grade group was not statistically significant.

Last, significant differences were found between the grade groups in the proportion of teachers who made alterations in other curricular areas (e.g., music, art, social studies). A significant difference was found between the earliest grade group and the most advanced grade group in the proportion of teachers who made curricular alterations in other areas of instruction, with significantly more changes made in the earliest grade group as compared to the most advanced grade group. No significant difference was found between the earliest grade group and the middle grade group, or between the middle grade group and the most advanced grade group, in the proportion of teachers who made curricular alterations in other areas of instruction.

Overall, the results of the Chi-Square analyses suggest that teachers in the earliest grades made more alterations in their reading, writing, and expressive language instruction as compared to teachers in the more advanced grades. Conversely, teachers in the more advanced grades made more alterations in mathematics instruction than teachers in the earliest grades.

The average level of rated academic adjustment was 4.4 (SD = 1.3). However, the average level of students' academic functioning was rated as slightly worse than that of last year's students (M = -.19, SD = .68).

Teachers were also asked how much time they spent per week integrating flood-related information into their curriculum. Fifty-six percent indicated that they spent 1-10 minutes per week, 26% spent 11-20 minutes per week, 7% spent 21-40 minutes per week, 4% spent 41-60 minutes per week, and 4% spent 60 minutes or more per week on flood-related activities. (Percentages do not add

up to 100% because two teachers did not respond to this question.) The most frequent activities teachers listed were flood-related writing assignments (e.g., journal, thank-you letters, essays, pen-pal letters, poetry) (75%); discussion of flood-related topics (e.g., students' experiences, information regarding floods and other natural disasters) (54%); flood-related reading assignments (18%); flood-related art work (14%); and flood-related songs (7%). Other activities described included developing a flood-related puppet show for younger students, drawing maps of where families relocated subsequent to the flood, developing a flood-related opera, and comparing students' flood survival skills to those of individuals described in literature. Several teachers in the parochial school described discussing the flood in relation to Biblical events.

Table 3 presents data regarding the amount of time that teachers spent integrating flood-related information into their curriculum as a function of grade. These data suggest that the amount of time spent generally increased as grade level increased. Table 4 presents information regarding specific classroom activities that were conducted by teachers in each of the three grade groups.

Table 3. Time Spent Per Week Integrating Flood-Related Information into Curriculum

Amount of Time Per Week	Grade Level		
	K-2	3-4	5-6
0-10 min	55	58	56
11-20 min	41	16	19
21-40 min	5	11	16
41-60 min	0	5	6
> 60 min	0	0	13

Note. Numbers in table refer to the percentage of teachers reporting that they spent a particular amount of time per week integrating flood-related information into their curriculum. Percentages for the 3-4 grade group do not equal 100% because two teachers in this group did not provide responses to this question.

Table 4. Specific Classroom Activities That Were Conducted By Teachers

Activity	Grade Level		
	K-2	3-4	5-6
Discussion of flood-related topics	54	58	50
Writing "thank-you" letters	23	26	6
Reading flood-related stories	23	16	0
Drawing flood-related pictures	23	11	6
Writing flood-related essays	18	41	19
Writing books related to the flood experience	18	11	0
Singing flood-related songs	14	5	0
Developing and performing a flood-related puppet show	14	0	0
Writing letters to pen-pals	9	16	0
Developing a "thank-you" videotape	5	0	0
Writing in journals about flood-related issues	5	16	6
Writing flood-related poetry	0	5	0
Making a flood-related quilt	0	5	0
Relating flood to other floods detailed in literature	0	0	13
Developing and performing a flood-related opera	0	0	13
Writing about the flood to students at other schools	0	0	6
Engaging in prayer related to the flood	0	0	6
Reading the newspaper about flood sequelae	0	0	6

Note. Numbers in table refer to the percentage of teachers reporting that they had engaged in a particular classroom activity. Percentages add up to more than 100% as many teachers engaged in more than one activity.

Ninety-two percent of the teachers reported that they believed that they had a role in helping students to cope with the flooding disaster. Reported roles included allowing time for discussion about the flood, listening to the students' stories and

apprehensions regarding the flood, providing the students with an emotional outlet through opportunities for drawing and writing, providing students with a normal, predictable environment, and providing students with replacement school supplies.

Discussion

This study examined curricular changes teachers employed to assist students academically and emotionally after a flooding disaster. Results showed that the majority of teachers in the study made some curricular changes in the ten months (i.e., first six months of the academic year) subsequent to the flood. For many teachers, curricular changes were unavoidable due to the loss of their lesson plans and books in the flood. These imperative alterations notwithstanding, many teachers also chose to spend more time than usual reviewing academic material from the previous year. Several teachers commented that they felt it was necessary to present material from the previous grade level because so much of the previous school year (i.e., five weeks) had been missed due to the disaster. Informal discussions also revealed that many teachers found that they not only needed to teach material omitted from the previous year, but also needed to review material taught in February and March of the previous year as students had been distracted with news of the impending flooding and had not retained some material taught in the late winter months. Teachers also reported choosing to review material from the previous academic year at the beginning of the academic year in order to ease students' transition to the school environment after the traumatic event.

Overall, the data obtained are consistent with the notion that curriculum content depends in part on the age of students in the classroom (Doll, 1992; Krogh, 1997; Rich, 1992; Webb, 1980). Examination of the data regarding specific curricular alterations and inclusion of flood-related information in the curriculum suggests that teachers in the upper grades (i.e., 5-6) were most likely to review mathematics content and include flood-related material in their curriculum only in very specific content areas (i.e., writing letters). Teachers in grades 4-6 appeared to focus

their review on mathematics and included a broader range of flood-related projects in their curriculum. Teachers in grades K-2 reported making the broadest curricular alterations; alterations were reported in mathematics, reading, writing, expressive language, and other curricular areas by a large proportion of the K-2 teachers. Unfortunately, it is difficult to tease out which curricular alterations of the K-2 teachers reflect review of material and which reflect additions into the curriculum of flood-related information. Clearly, specific flood-related projects could potentially serve both purposes.

Across the grades, teachers in this study integrated information regarding the flood into their curriculum in many ways. The purpose of this integration appeared to be two-fold. First, teachers described that the flood was a relevant context within which they could present information regarding many academic skills and content areas (e.g., writing, reading, social studies). Second, many teachers believed it assisted the students emotionally to be able to resolve thoughts and feelings related to the flood through classroom projects. Many informal and formal classroom activities (e.g., narratives, writing, art) allowed the students to express their emotions related to the flood. Whether the students truly needed this emotional outlet was not examined in this study; however, informal discussion with classroom teachers and school principals revealed that many school personnel perceived increases in students' behavior and emotional problems in the year subsequent to the flooding disaster. Thus, it is likely that one goal of the teachers in including flood-related information within their curricula was to facilitate their students' emotional recovery from the disaster.

Although most teachers adjusted their curricula to the students' academic needs subsequent to the flood (e.g., by providing additional review to students), teachers perceived that in the year after the flood, students were functioning slightly worse academically as compared to the previous year's class. However, according to the California Test of Basic Skills (CTBS), the academic skills of the Grand Forks students in the year subsequent to the flood did not differ substantially from those of students in non-flooded portions of North Dakota. Mean scores from sixth grade students in the Grand Forks Public Schools on

the CTBS, given in March of each year, from 1996 to 1998 are presented in Table 5. Due to the unavailability of data for individual children, statistical comparisons of students' scores across years and locations could not be conducted.

Table 5. Percentile Scores on the California Test of Basic Skills for Grand Forks and North Dakota

Test Area	Year					
	1996		1997		1998	
	GF	ND	GF	ND	GF	ND
Total Battery	60	64	58	63	67	65
Reading Total	60	61	59	60	66	64
Language Mechanics	59	66	57	65	57	65
Language Total	59	64	56	64	62	66
Mathematics Computation	52	61	47	59	63	65
Mathematics Total	59	66	58	65	67	66
Spelling	58	61	57	61	66	64
Science	68	70	66	70	66	67
Social Studies	76	74	72	74	68	68

Note. National mean percentile score is 50. The California Test of Basic Skills/4 was given in 1996 and 1997. The California Test of Basic Skills/5 was given in 1998. Scores are given for tests that are represented on both forms of the test. GF = Grand Forks; ND = North Dakota.

In our view, the present research appears to be a first step toward determining what schools may do to assist students academically after a significant disruption in the academic year. We know what teachers did in their classrooms in the six months subsequent to a disaster that ended an academic year five weeks early; we know from CTBS data that students in these schools were no worse off academically than their peers in other parts of the state that did not experience this loss of classroom time. We cannot determine from the present study, however, what it was specifically that contributed to the positive academic outcomes for these students. Was it the review of material that teachers conducted? Was it the integration of highly relevant (i.e., flood-related) information into

the usual academic curriculum? The psychological and educational literature supports the suggestion that both teachers' review of material from the previous academic year (e.g., Dempster, 1996; Hilgard & Bower, 1981; Rea & Modigliani, 1988; Woolfolk, 1993) and their inclusion within their curriculum of information that was highly relevant to their students (e.g., Ashton-Warner, 1963; Carlson, 1980; Needels & Knapp, 1994; Krapp, Hidi, & Renninger, 1992; Radnor, 1994) was likely advantageous to the students academically.

Other factors that may have contributed to the overall positive academic outcome of these students include curriculum review that parents conducted with their children over the summer and any formal instruction that the students received after the flood (e.g., attending school at another location after the flood, attending summer school). Future studies should more closely examine the effectiveness of these broad categories of academic intervention (i.e., teachers' review of curricular material, teachers' integration of disaster-related content into the curriculum, parents' review of curricular material, students' attendance at summer school or other schools) subsequent to disasters that significantly disrupt the academic year. Similarly, experimental studies should be conducted to determine what specific types of curricular adjustments are most advantageous to students' academic progress after significant disruptions in the academic year.

Another question that arises from this study is how much review of academic content and inclusion of disaster-related information into the curriculum is optimal. Teachers in this study described spending widely varying amounts of time on curricular alterations in the six academic months after the disaster. It appears from the students' CTBS scores that the amount of time teachers allocated to curricular alterations was adequate when considering students' academic achievement in the year subsequent to the flood. However, students' emotional functioning was not assessed formally in this study; one might ask if the time spent integrating flood-related information into the curriculum was adequate for students' emotional recovery. Whether teachers should take on the role of assisting students' emotional recovery subsequent to a disaster is obviously open to question as well.

The vast majority of teachers (92%) in this study saw themselves as having a role in helping students cope with the disaster; however, the data suggest that the specific nature of and time allocation to this role varied considerably across teachers.

As events that interfere with the normal course of the academic calendar occur with some regularity, schools may find it advantageous to develop contingency plans for loss of large blocks of academic time. Although we have focused on a natural disaster in this paper, there are clearly other events that may disrupt the academic year significantly, including episodes of violence occurring at schools and technological disasters (e.g., a nuclear power plant disaster). One could argue that no school is exempt from the risk of a significant disruption in the school calendar. Thus, all schools could find it advantageous to develop contingency plans for events that result in the loss of a significant number of school days.

Several aspects of academic recovery could be included within these contingency plans. Plans could be made regarding what would be expected of parents, school officials, and teachers subsequent to such events. For example, would parents be expected to home-school children in these situations? Would teachers review material that had been taught prior to the disruption? What specific curricular alterations would teachers make? The point at which such a contingency plan should be implemented (e.g., if school is disrupted for one week, or two weeks) could also be discussed in such a plan. It is also recommended that plans include discussion of ways to record actions taken by parents, teachers, and school personnel subsequent to the disaster in order to learn more about the types of academic interventions that are most helpful to students after disasters and other significantly disruptive events.

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