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The Elementary Science Teaching Rationale (STR): Analysis via a Preservice Teacher Self-Report Instrument

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This paper represents Part I of a two-part study examining preservice teachers' development of a personalized, research-based Science Teaching Rationale (STR). Researchers have historically documented the application of the "rationale paper" (Clough, 1992; Veronesi, 1998) using qualitative methodologies. Since the rationale paper continues to receive attention at conferences (e.g., at the annual conference of the Association for the Education of Teachers in Science) and grow in popularity as a term assignment among science educators, further study was warranted. This quantitatively dominant study, using the "Self-Report Instrument for the STR," is the first work of its kind on the STR. It adds to the body of understanding regarding its impact on the thinking and dispositions toward science teaching of preservice elementary teachers. Discussion on development, implications, and elements of instrument reliability and validity are included.*

*(*Part II of this study, published as a second manuscript, is dedicated to further discussion of relevant literature and the historical development of the STR. It also provides an extended examination of instructor habits which facilitate preservice teacher success.)*

Introduction

Teacher educators constantly search for authentic tasks that assist students in linking educational theory to everyday teaching activities. The authors have found that the Science Teaching Rationale (STR) addresses this well-documented need. Establishing personal and pragmatic links between theory and practice is an effective strategy for influencing preservice teacher beliefs, thus facilitating the construction of a more coherent and useful epistemology (Beck, Czerniak, & Lumpe, 2000; Brickhouse, 1990; Gess-Newsome, 1998; Hofer & Pintrich, 2002; Pajares, 1992; Varrella, 1997). The STR is the culminating assignment in the authors' elementary science methods courses. The STR requires each elementary preservice teacher to meld key aspects of their science methods study related to pedagogy, curriculum design, assessment, and learning theory into one coherent and literature-based "rationale paper."

In these times of increased attention to performance-based assessment (PBA) it is incumbent upon teacher educators to develop techniques to study the efficacy of specific high stakes course performances. Studies such as this one

serve to measure students' progress and validate assessment techniques from the important perspective of the preservice teacher. The researchers considered the STR an effective end-of-term assignment based on the consistent quality of their preservice teachers' final products; however, without corroborating evidence from their students, the authors held a one-sided perspective.

The outcomes validate the significance of the STR as a pivotal assignment. From the perspective of the researchers, this inquiry into their own teaching provides confidence in this final assignment of their methods courses. From the preservice teachers' perspective, the STR has a personal and potentially long-term impact on their understanding of effective science teaching and burgeoning epistemologies (i.e., philosophy and personal beliefs about teaching and learning). The strategies and techniques used in this study may also serve as a model for the examination of the value of specific PBAs used for accreditation purposes (e.g., the NCATE process).

Relevant Literature and History

The STR is a statement of beliefs about teaching, which is constructed around personal actions (i.e., instructional choices) and relevant literature on science teaching. Pajares (1992) captures the wide range of elements underpinning teachers' beliefs, which can be classified as a "beliefs system." Pajares' current definitions are drawn from frameworks influenced by individuals' attitudes, values, judgments, axioms, opinions, perceptions, conceptual systems, preconceptions, dispositions, implicit and explicit theories, personal theories, action strategies, rules of practice, repertories of understanding, and social strategies. Researchers who have examined the nature of teacher beliefs and their impact on instructional choices in the classroom agree that there is a strong linkage between personal beliefs and daily teaching habits (Brookhart & Freeman, 1992; Goodman, 1988; Hammer & Elby, 2002; Jakubowski & Tobin, 1991; Kagan & Tippins, 1992; Munby, 1982; Wilson, 1990). A refined and well-constructed belief system regarding teaching and learning is an asset to teachers as they attend to their responsibilities, which range from daily planning to long-term curriculum development and management of external forces and priorities (Varrella, 2004).

Years of personal experience and the influence of traditionalist and progressive priorities affect the early constructs of the preservice teacher's belief system. Advancement to a richer beliefs system requires a disposition of reflection-into-action (Interstate New Teacher Assessment and Support Consortium, 1992; Schön, 1983). Regardless of the subject matter area, such reflections are only a tool or vehicle (Rodgers, 2002), and the "actions" that follow are critical. These actions should elicit the development of an extant and enriched set of beliefs about teaching and a sense of "civic learning," which is an element in a personal disposition toward lifelong learning. This civic mindedness bridges subject-matter perspectives and impacts teachers' choices in their classrooms. It is necessary for each preservice teacher to develop the skill and discipline to continuously reexamine their choices in the balancing act that every thoughtful teacher engages in each day between attention to each learner's individuality and teaching the "sublime content" (Ackerman, 2003, p. 349) of state and national standards. This balancing act and its requisite cycles of reflection and action necessarily span both technique and philosophy (Varrella & Veronesi, 2004). To maintain equilibrium in our ever-changing educational environment, a teacher needs a secure set of well-articulated beliefs about teaching and learning.

The earliest discussions of the STR as an element in a preservice teacher's repertoire of key experiences are found in Penick and Lunetta's (1980) work. Penick attributes the origins of his thinking on the "rationale paper" to Dorothy Schlitt, his mentor (personal communication, spring 1995). He has most recently stated that beginning teachers who develop a research-based rationale for teaching science are better prepared to plan, self-assess, and "continually apply best teaching practices" (Penick, 2003, p. 46). Self-assessment is a key element of reflection in action as described by Schön (1988) and remains a pivotal aspect of the preservice teachers' experience in writing their personal STR, as well as fostering Clark's (1999) advocacy for a disposition of civic mindedness described above.

The STR has been studied and the merits of its use highlighted in the works of Clough (1992), Tillotson (1998), Veronesi (1998), and Veronesi and Varrella (1999). All of these science educators concur with Penick (2003) who describes the development of the STR (or the "rationale paper") as a cornerstone in the foundation of a career dedicated to "purposeful teaching." Recently, the STR, as a foci to develop purposeful teaching, has garnered attention through roundtable sessions at the annual conference of the Association for the Education of Teachers in Science in 1998, 1999, 2000, and 2001, and is the subject of a draft NSTA monograph, *Teaching with Purpose* (Penick & Harris, 2003).

Use of the Rationale in the Authors' Classes

The writing of the STR enriches and strengthens the epistemological links between theory and personal choices for best practice. The STR is the end-of-term, culminating assignment in the authors' science methods courses, providing a window looking into the individual preservice teacher's future classroom. A well-crafted rationale paper includes a discussion on the actions and activities of the author (the preservice teacher) and of their students. Most importantly, the rationale extends thinking on teaching beyond how to the why, which shifts the preservice teacher's thoughts to the realm of his or her beliefs about teaching and the basis for those beliefs. Each preservice teacher must draw upon personal beliefs about how to teach as well as on concrete experience and literature-derived concepts, all in order to offer a cogent "rationale" to support their future choices in the classroom.

Methodology

Setting

The instructors (co-authors) shared a commitment to interactive teaching, a constructivist epistemology, and expectations for their preservice teachers related to the outcome of the rationale. Both instructors held to a common set of goals in their methods classrooms, emphasizing and modeling an inquiry-based approach to science teaching. The instructors believed that this approach encouraged a balance between methods, techniques and curriculum development, and the exploration of the literature to link theory and practice. Only the course timelines differed between the two sites. At Site 1, all preservice teachers were on a standard quarter system, including one 10-week science methods course for elementary preservice teachers. The STR was the last assignment, and it was due on finals day. At Site 2, a general methods course preceded the science methods course (taught by the science teacher educator), and the eventual written rationale was

"defended" in an interview with the second author during finals week, following the completion of science methods.

Population

The population (N=74) for this study was drawn from three undergraduate-level elementary science teacher preparation courses taught at two different universities, one in the Midwest and the other in New England. Thirty-four preservice teachers from two different science methods courses comprised the study population at Site 1. These preservice teachers were undergraduates in their early twenties, and most were in their junior year of college. All of the students from Site 1 were admitted to the undergraduate teacher preparation program. At Site 2, 40 elementary preservice teachers were enrolled in a two-semester methods sequence, which included a fall general methods course followed by a second spring science methods course. The students at Site 2 also had been accepted into the teacher preparation program. The age range at Site 2 was broader than at Site 1, including many "career changers" in their 30s and 40s. Response to the questionnaire was voluntary, with over 90% of the students in the classes at Site 1 and 2 opting to complete the questionnaire. The predominant gender among the students was female (approximately 94%).

Design

The instrument utilized a quantitative dominant design, focusing on elementary preservice teachers' experiences and opinions regarding the value of the STR in their preparation to teach elementary science. The instructional methods and the evaluative tool discussed here emerged hermeneutically. Dialog and collaboration between the authors influenced the refinement of these elements, including self- and interpersonal reflections on teaching efficacy and previous experiences with the STR. A post hoc design was used (Creswell, 2003), and data were collected at the end of the term after the preservice teachers had completed all of their coursework. It was the researchers' contention that this was the best point for the preservice teachers to reflect accurately and honestly on the merits of the STR within their program of study.

Questionnaire (Instrument) Development

The primary data-gathering instrument was a questionnaire, the "Self Reflection Survey for the Science Teaching Rationale." This instrument employs a nominal (Likert) scale, which included four categories: SA = Strongly Agree; A = Agree; D = Disagree; and SD = Strongly Disagree. Twenty-nine items were included in the questionnaire. Two additional open-ended response items (see Appendix) invited comments on factors that assisted the preservice teachers in writing their rationale as well as related general comments.

The 11-item questionnaire described by Veronesi (1998) was the predecessor of this 29-item instrument on the science teaching rationale (STR). The self-reflection questionnaire for the STR (see Appendix) included 18 positively worded questions and 11 negatively worded questions. For example:

3. I truly believe what I wrote in my STR and will try to implement these ideas in my classroom.
4. What I wrote in my STR was done only to get a good grade.

A colleague with expertise in psychometrics critically reviewed the instrument prior to its application in this study. Preservice teachers signed a release granting the researchers permission to use their responses, but not their names. Data were collected from the preservice teachers after completion of their STR assignment.

Results and Analysis

Results from Site 1 and 2

A series of means were calculated for Site 1 and Site 2 separately. On visual inspection alone, it was clear that although the timeframes were very different—one quarter (Site 1) compared to two semesters (Site 2)—the patterns of responses were remarkably consistent. Before collapsing the data into one set to explore fundamental psychometric properties of reliability and validity of the instrument, the two subsets were compared using a one-way ANOVA. Table 1 summarizes the results of the one-way ANOVA and includes the F-statistic and the probability (p-value) of a significant difference between the rankings for the items, comparing Site 1 to Site 2. As evidenced in Table 1, there were no significant differences among the majority of the responses from the two sites (i.e., for 23 of the 28 items included in the final analysis); however, the means and standard deviations varied enough on item numbers 2, 5, 11, 26, and 29 to generate a significant difference at the $p < 0.05$ level. The authors attribute the significant difference in the response patterns of items 2, 5, and 11 to differences in teaching style and expectations of preservice teachers between Site 1 and Site 2. Specifically for item 2, there were site-based differences in the types of intermediate activities leading up to the writing of the final rationale. For item 5, there was no interview at Site 1, so the question was hypothetical at best for the preservice teachers at that site. For item 11, only a minority of the preservice teachers at Site 1 were actively developing portfolios. The response patterns for question 26 (broader range, higher standard deviation and the only question that did not have an average above "3 – Agree") indicated ambivalence on the part of the preservice teachers regarding the importance of further field experience. The researchers attribute this variation to the uneven quality of the preservice teachers' field experiences (anecdotal observations based on the authors' field supervisory activities), individual maturity, attitude and outlook, as well as previous work experience. Question 29 ("What students will be doing as reflected by your rationale") provides an indicator of the general dispositions of these preservice teachers at this point in their preparation to become elementary teachers. The preservice teachers at Site 1 (n=34) were more concerned about their own actions than their students' actions, when compared to the preservice teachers at Site 2 (n=40). A concern about procedural and management issues is most common among "novice" teachers (Berliner, 1986, 1988). Since most of the preservice teachers at Site 1 were undergraduates, less experienced, and younger on average than the population at Site 2, this discrepancy is not surprising. Last, item 10, "I would prefer to choose my own topics to write about in my STR," was eliminated from the analysis. Because elements critical to the rationale were "unpacked" for the preservice teachers through class discussions, as well as defined by grading rubrics and accompanying guidelines, the question was confusing (students noted this) and, in reality, irrelevant.

When the data from the two sites were collapsed, the means for each item were above three (i.e., means ranging from 3.1 to 3.8 on a 4.0 scale) with the exception of item 26 (M=2.6) as noted above. Considering that a "3" represents agreement

and a "4" represents strong agreement, it may be deduced that the students were positive to very positive about their STR and considered it a critical element in their program. For this first analysis of the self-report instrument, since the patterns of responses were consistent (i.e., positive), the researchers chose to include 28 items, excluding item 10, for the balance of the statistical analyses.

Table 1
Summary of One-Way ANOVA for Site 1 (n=34) and Site 2 (n=40)

Item #	One-Way ANOVA		Item #	One-Way ANOVA		Item #	One-Way ANOVA	
	F	P		F	P		F	P
Item 1	0.57	0.45	Item 12	2.68	0.11	Item 22	0.60	0.44
Item 2	17.26	*0.00	Item 13	1.63	0.21	Item 23	2.17	0.14
Item 3	0.00	0.99	Item 14	0.47	0.50	Item 24	0.49	0.49
Item 4	0.06	0.81	Item 15	0.02	0.88	Item 25	1.76	0.19
Item 5	4.64	*0.03	Item 16	1.28	0.26	Item 26	4.65	*0.03
Item 6	0.39	0.54	Item 17	0.02	0.89	Item 27	1.76	0.19
Item 7	0.23	0.63	Item 18	0.01	0.91	Item 28	1.10	0.30
Item 8	2.74	0.10	Item 19	0.37	0.55	Item 29	9.71	**0.00
Item 9	1.98	0.16	Item 20	1.46	0.23			
Item 11 •	9.71	*0.00	Item 21	0.07	0.80			

• Item 10 was eliminated prior to data analysis.
Note: * $p < .05$. ** $p < .01$.

Exploratory Factor Analysis, Reliability, and Construct Validity of the STR

The 28 remaining items were analyzed for their level of reliability, including calculation of a Cronbach's alpha and item-to-total correlations. The calculated Cronbach's alpha reliability coefficient value (r=0.92) indicated the instrument was highly reliable. With the exception of item 24 (r=0.15), item-to-total correlations were acceptable. Twenty-one of the 28 items showed a moderate to high level of correlation (r>0.5). Six of the items showed a lower correlation with a range of from 0.29 to 0.49.

A five-component factor analysis, using a varimax rotation, provided insight into the preservice teachers' patterns of responses in their self-report. The factor analysis accounted for approximately 61% of the variance (Table 2). Although a rotation with up to eight factors could have been used, all with eigenvalues greater than 1, which indicates "stability" of the factors (Girden, 1996), it was felt that this would create an excessive and confusing set of primary categories. The key five categories from the factor analysis are as follows:

C-I: "Connecting the preservice teachers' ideas with the realities of teaching"
C-II: "Personal significance of the science teaching rationale"
C-III: "Confidence in and construction of the preservice teachers' science teaching rationale"

C-IV: "Importance of the elements and beliefs outlined in the science teaching rationale"
C-V: "Effective use of time related to the development of the science teaching rationale"

Table 2
Factor Analysis - Exploratory principle component solution with varimax factor rotation for the science teaching rationale (STR), N = 74.

Factor	Variance Explained by Each Factor	Percent of Variance Explained by Each Factor
Factor 1	4.73	17%
Factor 2	4.40	16%
Factor 3	2.96	11%
Factor 4	2.42	9%
Factor 5	2.11	8%
Total percent of variance explained by the exploratory analysis		61%

To facilitate possible use by other methods instructors, the instrument has been restructured to reflect the outcome of this factor analysis and is appended.

When considered together, these analyses support the premise of overall construct validity and the general reliability of the instrument as applied in this study. The stable factor structure, the Cronbach's alpha (r=0.92) for the instrument, and the amount of variance accounted for in the factor analysis (61%), all contribute to issues of validity and reliability. The item-to-total correlations (0.44-0.70 for 25 of the 28 items) and the content validity of the items related to the topic of study lend additional confidence to the general construct validity as well.

Discussion and Corroborating Evidence

The preservice teachers from both populations held positive perceptions and beliefs about their STR formulation. In the space provided for open-ended comments in the questionnaire, the preservice teachers at Site 1 identified three main areas of value for their STRs. First, the preservice teachers felt that they were confident in what they had written and were eager to use their STRs during job interviews: "I know [it] will be a strong reference in my future job interviewing." Second, the preservice teachers appreciated the process of writing their STRs, which led them to consider state and national science standards related to their role as a teacher. Third, they felt that they had a much clearer vision of their future science teaching practices because the "rationale helped me pull my ideas about [science] teaching together." Many preservice teachers at Site 1 noted in their written comments that they were going to use the frameworks they described in their STRs in a practical way: "I think the rationale paper is the clearest and single most helpful assignment I have had in this program!" Preservice teachers at Site 2 responded in a like manner. For example, like their colleagues at Site 1, the Site 2 preservice teachers focused on how the rationale made them "think" about teaching elementary science from a literature-based standpoint. Individuals at Site 1 stated that their "beliefs about teaching elementary science were finally realized," indicating the personal empowerment experienced by defining and defending a chosen instructional

style and a commensurate set of beliefs about teaching and learning. It is important to note that the preservice teachers' written comments align well with Categories I-IV defined through the factor analysis. This alignment between written comments and these categories of scaled responses related to context, beliefs, confidence, and personal significance add to the overall validity of the results of this study.

Candidates at both sites discussed the information sources they utilized in their rationale development. The frequency of responses dictated the order of the referenced sources summarized in Table 3, with the most frequent response listed first. Not surprisingly, the methods course itself was the most commonly referenced source of information. Instructor-devised curriculum and guidance influenced these preservice teachers' perceptions and beliefs as well as their final written STR. The nature of these comments is reflective of students who have not completed student teaching or an internship. At this point, the preservice teachers are still reliant upon course materials and their professors as primary resources.

Table 3
Ranking of Sources for the STR from Site 1 and Site 2 Methods Preservice Teachers

Site 1	Site 2
Primary Importance: 1. Field experiences 2. Handouts in class 3. Class texts 4. The instructor	Primary Importance: 1. The instructor (much individual feedback given) 2. Library research (specific journals named) 3. Peers 4. Internet
Secondary Importance: 1. Instructors from other classes 2. Peers 3. Library 4. Science standards	Secondary Importance 1. Experiences from previous jobs 2. State and national science standards 3. Cooperating practicum teacher 4. Instructors from other classes 5. "Remembering what my experiences were like in elementary science"

The authors have found that the STR provides the catalyst for "connectivity" between theory and practice in the minds of the preservice student. Connectivity is strongest when the generally reflective STR work is treated as an inquiry into the teacher that "you wish to become." When using a framework of inquiry into their own teaching, the preservice teachers are able to meld personally meaningful theory-based resources and experiences together into one cogent written product. The preservice teachers' sense of ownership (typified by responses in Category II and II) of their STR is pivotal, providing them with a personal, rich, and clear set of research-based beliefs that will inform and guide their future daily instruction.

The pattern of the STR's positive impact on the authors' preservice teachers extends beyond the timeframe of this study. For example, the first author, now at a different institution, has his entire methods class rate the value of all key course assignments/events each semester on a scale of 1 to 5 (1=poor, 2=fair, 3=good, 4=very good, 5=excellent). The average ratings of the STR by these preservice candidates (all enrolled in graduate school of education programs) consistently fall between the levels of "very good" and "excellent." This reliable response pattern spans elementary and secondary preservice teacher populations at the author's institution. For example, in the last two

elementary science methods classes (cohorts) taught by the first author, the mean rating averaged 4.7 on the five point scale (1=poor; 5=excellent), which was identical to results from a secondary science methods cohort (M=4.7) taught during the same academic year. Only a field-based microteaching assignment was more highly rated among those secondary students, and in that instance, the microteaching assignment became a primary source of experience referenced in the secondary preservice teachers' STR.

Conclusion

The STR is the preservice teachers' statement about their "beliefs in action." Based on this description, this study responds to Pajares' (1992) advocacy of more research on teachers' beliefs and constructs related to teaching and learning. The results of this study indicate that the STR can provide a critical experience affecting developing teachers' beliefs and appreciation for the pragmatic relationship between theory and practice. By self-report on the questionnaire, these 74 preservice teachers indicated that the STR experience clarified their view of "self-as-teacher" and solidified their personal perspective on teaching and learning.

One of the most powerful arguments for the importance of the STR rests in the synergy among three of the five categories that emerged from the instrument analysis. The elements of "Connecting the preservice teachers' ideas with the realities of teaching" (C-I), the "Personal significance of the [STR]" (C-II), and the "Importance [to the preservice teacher] of the elements and beliefs outlined in the [STR]" (C-V) represent the development of that personal construct of self-as-teacher. Learning to teach is contextual, taking place in settings with a specific array of cultural, social, and professional expectations (NRC, 2000). This "STR experience" is pivotal in helping teachers to become, as Cruickshank et al. (1996) advocate, "students of teaching more than . . . merely skillful at teaching" (p. 52).

The mélange of written comments, anecdotal evidence, and the categorical results of the factor analysis indicate that these preservice teachers enjoy a more detailed understanding of how research and practice go hand-in-hand. This enriched view of purposeful elementary science teaching provides a headstart during student teaching or internship, as well as during the induction years of elementary teaching. These preservice teachers begin to perceive themselves as purposeful teachers who are able to confront the complexities of external expectations, the needs of their students, and the contexts in which all of these operate. Though they cannot master all elements of effective elementary teaching in one course, the STR becomes a focal point to assemble those elements into one coherent framework. The STR experience empowers the preservice teacher with a disposition toward reflection-into-action (Interstate New Teacher Assessment and Support Consortium, 1992; Rodgers, 2002; Schön, 1983). This disposition will assist them as they make choices based on a deep personal understanding of teaching and learning, rather than simply following district, state, or federal diktat. One former student of the first author—now a second-year teacher—volunteered this unsolicited comment:

> *There was a particular assignment, during Science Methods . . . on creating a rationale that I felt was of real importance; however, it was not until I needed to rely on this for employment that I realized its true value. The rationale allowed us to talk about who we were and would be as teachers. We were able to present the roles of the teachers, the roles of the students, the teaching methods that are likely to be implemented, and the methods of assessing the students' learning that will take place. I relied heavily on this for focus when I went for my interview, but also reflected back on it last year during my first year of teaching.*

What are not apparent through these data are the specific instructor characteristics that contribute to the successful application of this important teacher preparation strategy. This topic, deserving of further disciplined scrutiny, is the subject of a second follow-up study by Varrella and Veronesi (2004). Longitudinal studies of preservice teachers exploring related and confounding factors, particularly during the induction years, are warranted as well.

(Rubrics for STRs, recent examples of elementary and secondary STRs by preservice teachers, and suggestions of how the STR can be used as documentation for NCATE may be provided by the authors upon request.)

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Appendix

Self-Reflection Survey for the Science Teaching Rationale (STR)

(Although the items have been reorganized to reflect the five factor analysis, the numbers of the questions are those from the original questionnaire. Question #10 is not included. Instrument may be used with permission of either author.)

Category 1: Connecting Ideas with the Realities of Teaching

12. I see no relationship between my STR and the course content of my science methods course(s).

SA A D SD

16. I see no relationship between what my elementary students will be doing in my future science classes and what I wrote about in the STR.

SA A D SD

9. My STR does not really represent the realities of the science classroom.

SA A D SD

7. Topics that I have written about in my STR do not relate to other subject matter areas or aspects of school teaching.

SA A D SD

29. The part of my STR that describes what my students will be doing in my class is an important part of my overall rationale for teaching.

SA A D SD

25. The part of STR that describes what I will be doing in my class is an important part of my overall rationale for teaching.

SA A D SD

8. I probably will not use the ideas in my STR to teach science.

SA A D SD

20. Preparing the STR helped me focus on things that will make me a better teacher.

SA A D SD

Category II: Personal Significance of the Science Teaching Rationale

13. Now that it is finished, I am glad I wrote my STR.

SA A D SD

15. I am proud of the work I did as represented through my STR.

SA A D SD

22. I will not look at my STR paper again.

SA A D SD

14. I have used ideas and materials from other education courses to help me write my STR.

SA A D SD

21. I will share my STR with the classroom teachers I work with when I student teach.

SA A D SD

23. My time could have been better spent working on curriculum and other types of projects.

SA A D SD

28. Writing the STR should be dropped from the course expectations.

SA A D SD

14. What I wrote in my STR was done only to get a good grade.

SA A D SD

Category III: Confidence in and Construction of the Science Teaching Rationale

2. The rough draft/outline of my STR, which was critiqued with suggestions for improvements, helped me to understand how to construct my STR.

SA A D SD

1. The process I went through in writing my Science Teaching Rationale (STR) made me feel more confident about teaching science.

SA A D SD

11. The STR will be an important element of my portfolio.

SA A D SD

18. Informal discussions with the instructor helped me to write my STR.

SA A D SD

27. Writing the STR has helped me construct the "big picture" of how I will teach science.

SA A D SD

19. I used my field experiences (in this and/or other classes) to help me write and explain points in my STR.

SA A D SD

Category IV: Importance of the Elements and Beliefs Outlined in the Science Teaching Rationale

3. I truly believe what I wrote in my STR and will try to implement these ideas in my classroom.

SA A D SD

6. Topics that were suggested (like wait-time, constructivism, questioning, and hands-on science) to write about will be important to me for teaching science to children.

SA A D SD

5. I am confident that I can respond to any question regarding what I wrote in my STR during a 15-minute exit interview.

SA A D SD

Category V: Effective Use of Time Related to the Development of the Science Teaching Rationale

24. Working collaboratively and generating a "group STR" would have been a more beneficial way for me to complete this project.

SA A D SD

26. My time could have been better spent with more field experiences.

SA A D SD

17. Informal discussions with my classmates (in or out of class) helped me to write my STR.

SA A D SD

List things (e.g., people, resources, experiences, etc.) that helped you write your rationale.

Other general comments:

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