

TRADE BOOKS IN ELEMENTARY EDUCATION: MISCONCEPTIONS IN SCIENCE

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Elementary pre-service teachers are required to take only a few science courses and are not likely to have the pedagogical content knowledge necessary to choose accurate science trade books. Incorporating trade books in the content areas is a method for integrating subjects and is a common practice among elementary teachers. This study investigates the ability of pre-service elementary teachers to identify misconceptions in science trade book excerpts chosen by the researcher. Survey results were analyzed based on pre-service teachers' responses to a science content question. Often, students focused on misconceptions related to anthropomorphism when they were unsure of the science content as shown by the true/false question. Each of the teacher educators interviewed had experiences with several pre-service teachers' lack of content knowledge affecting performance in the classroom.

Keywords: science, pre-service teachers, misconception, trade books, elementary education

TRADE BOOKS IN ELEMENTARY EDUCATION: MISCONCEPTIONS IN SCIENCE

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Chapter 1: Definition of the Problem

Purpose

The current trend of integrating children's books into science instruction to further both science and language arts comprehension has also created concerns about the accuracy of science content in children's literature. The purpose of this thesis project was to describe the current content knowledge of pre-service elementary teachers as noted by their answers to an online survey with children's trade books excerpts containing science misconceptions.

Introduction to the Problem

Science instruction is no longer side-lined because No Child Left Behind legislation requires standardized testing in science; the ensuing consequences of this legislation were an increased awareness of the links between science and literacy (Rearden & Broemmel, 2008). As teachers focus on incorporating literature into science, trade books are popular due, in part, to teachers' familiarity with the benefits of reading (Atkinson, Matusevich, & Huber, 2009; Plummer & Kuhlman, 2008; Rearden & Broemmel, 2008; Rice, 2002; Schussler, 2008). Integrating children's trade books into content areas is a current trend in teacher preparation and lesson planning (Atkinson et al., 2009; Plummer & Kuhlman, 2008; Rice, 2002; Schussler, 2008).

Concerns have developed about the accuracy of science content in children's trade books (Abell, 2008; Atkinson et al., 2009; Rice, 2002; Sackes, Trundle, & Flevares, 2009; Schussler, 2008; Smolkin et al., 2008). To be effective, trade books should contain accurate science content and be high quality; not all trade books available on science content include correct content information (Abell, 2008; Atkinson

et al., 2009; Brommel & Rearden, 2006; Rice, 2002; Sackes et al. 2009; Schussler, 2008; Smolkin et al., 2008). Given the few science methods courses required of pre-service elementary education students, the researcher was interested in whether these pre-service elementary education students could identify misconceptions presented in trade books.

Research Question

With the increase in science and literature integration through the use of trade books, teachers should evaluate each book for content accuracy. Studies have documented pre-service teachers' lack of content knowledge related to science, specifically related to moon phases and physical science (Stein, Larrabee, & Barman, 2008; Trundle, Atwood, & Christopher, 2006). This descriptive research study focused on the following question: When given excerpts from children's trade books focusing on science content, will elementary education pre-service teachers at East Carolina University identify misconceptions in the science content during a review of the books?

Terminology

Trade books. Trade books refer to books published for and available to the general public; these books may be purchased in book stores and can be found at local libraries. Trade books are available in a wide variety of genres including non-fiction, fiction, and poetry.

Misconception. A science misconception is a thought stemming from incorrect or confusing information. Often misconceptions are formed as a way to answer a question about the world around us. Misconceptions can be advanced through reading

literature or in classroom settings; misconceptions can be corrected in a classroom setting and by reading accurate literature.

Chapter 2: Review of the Literature

Integrating Content

Integrating content subject areas is an instructional method that can be used to promote real world problem solving and to increase connections in student knowledge (Plummer & Kuhlman, 2008). In addition to promoting connections between subject areas, a variety of instructional methods can be used with integration to increase student learning. Trade books are a popular method currently used to integrate subjects as teachers are asked to create young scientists through the inclusion of science, technology, engineering, and mathematics (STEM) into the classroom.

Trade Books

Trade books are books marketed to a general audience rather than books marketed to a specialized group as is the case with textbooks and school systems (Schroeder, McKeough, Graham, Stock, & Bisanz, 2009; Schussler, 2008). Trade books can be purchased at local bookstores and are available in libraries, making their availability an advantage over traditional textbooks; children's picture books, fictional stories, and non-fiction information books are considered trade books (Rice, 2002; Schussler, 2008).

At the primary level, educators use trade books as resources in the classroom (Atkinson et al., 2009; Plummer & Kuhlman, 2008; Rice, 2002). Science trade books have expanded beyond non-fiction to include fiction, science fiction, and poetry (Broemmel & Rearden, 2006; Rice, 2002). Goals include incorporating reading and

writing skills into other subjects as well as increasing student interest in science and providing students with positive support (Plummer & Kuhlman, 2008; Shelley, 2007). Atkinson et al. (2009) offered the conclusion based on classroom experience that literacy and content area integration assists with students' understanding of the content and engages a variety of skills.

Textbooks versus Trade Books

Textbooks have been criticized for containing difficult reading levels and fragmented flow whereas trade books are available in a wide range of reading levels (Rice, 2002). Although textbooks are written for a specific grade level, they often contain varying reading levels in order to explain complex content that is understandable only with advanced vocabulary, thus having an impact on the readability levels of the textbook. Textbook reading levels may not match the diversity of reading levels within a classroom. When compared to textbooks, trade books such as *The Magic School Bus on the Ocean Floor* (Cole, 1992) and *Some Bugs Glow in the Dark (I didn't know that)* (Llewellyn, 1997) are more interesting to students. In addition to interesting story elements, researchers found more explanations in trade books when compared with textbooks; differences have been noted in life science and physical science trade books (Smolkin et al., 2008). Physical science trade books contained more explanations at the early elementary level than the life science trade books (Smolkin et al., 2008). Explanations are important for promoting science literacy and accuracy aligning to the goal of expanding science instruction beyond facts and descriptions (Broemmel & Rearden, 2006; Smolkin et al., 2008).

Trade books have been praised for aiding student comprehension, providing information in an interesting manner on an appropriate reading level, and promoting women and minorities' involvement in science fields (Abell, 2008; Atkinson et al., 2009; Rearden & Broemmel, 2008). By accommodating various reading abilities, trade books reduce the intimidation factor associated with textbooks. The inclusion of women and minorities corresponds with the trend that trade books are generally more up to date than textbooks and are more related to students' lives (Rice, 2002). Trade books are available in a variety of genres, thus appealing to readers who struggle with narratives (Atkinson et al., 2009; Plummer & Kuhlman, 2008). Non-fiction can be an interesting genre for students who struggle with reading but are intrigued with the world around them. In addition to the enjoyment of learning new facts, motivation and achievement of students increase when students find texts that answer their questions (Brassell, 2006; Plummer & Kuhlman, 2008; Smolkin et al., 2008).

Selecting books from a variety of genres extends the benefits of reading aloud. Both fiction and non-fiction can be used to support student learning in science (Plummer & Kuhlman, 2008; Rice, 2002). Not only can background knowledge be expanded through informational read alouds, but also comprehension may increase (Brassell, 2006). Science read alouds result in more frequent science trade book selections by students and increased vocabulary (Brassell, 2006).

Science Content Accuracy in Trade Books

Not all available trade books contain accurate science content, but in order to be effective, trade books must contain accurate science content and be high-quality. Concerns have developed as a result of viewing the accuracy of science content in

children's trade books (Abell, 2008; Atkinson et al., 2009; Rice, 2002; Sackes, et al., 2009; Schussler, 2008; Smolkin et al., 2008). Children's literature can be the source of the misconception that the Earth's shadow is the cause of the moon's phases (Sackes et al., 2009). During an evaluation of 79 children's books focusing on the moon, many did not represent the phases accurately and portrayed the Earth's shadow as the cause of the moon's phases misconception (Sackes et al., 2009). Trundle et al. (2006) concluded that pre-service elementary teachers were not ready to teach moon content as indicated by the National Science Teachers Association (NSTA) following a study on pre-service elementary teachers' knowledge of moon phases and the pattern of the phases. A research study by Stein, Larrabee, and Barman (2008), concluded that elementary students were likely to have teachers who have physical science misconceptions in the areas of gravity, force, and physical changes. Misconceptions and lack of content knowledge held by pre-service teachers interfere with the teaching of science.

Teaching with Trade Books

Trade books can be used in a variety of instructional strategies including the inquiry-based science 5E Learning Cycle (engage, explore, explain, extend, and evaluate), Know-Want to Learn-Learned (KWL) charts, direct instruction, questioning the author, and inquiry-based learning. The many opportunities for trade book inclusion in an elementary classroom make them practical textbook supplements. Assessing prior knowledge before reading a book with misconceptions or inaccuracies is a way to promote critical reading and questioning (Rice, 2002). Teaching with thematic units is another strategy for incorporating trade books (Plummer & Kuhlman, 2008; Shelley,

2007). Through these instructional methods, students can learn new science content, focus on science process skills, and increase their desire to read (Abell, 2008; Plummer & Kuhlman, 2008).

Trade books are being used more frequently by teachers (Atkinson et al., 2009; Schussler, 2008). With the rise in popularity of trade books and their use in the science classroom, the science content and confrontation of misconceptions held by students and within books is important. Drawbacks to trade books include misconceptions in the text or illustrations, fantasy elements and anthropomorphism which refers to describing inanimate objects with human thoughts, feelings, and reasoning (Plummer & Kuhlman, 2008; Sackes et al., 2009). Fantasy and anthropomorphism lead to confusion in content understanding by students (Kallery & Psillos, 2004; Plummer & Kuhlman, 2008). Rice (2002) stated, "Misconceptions are alternately referred to in science education literature as naïve conceptions, preconceptions, alternative conceptions, or children's science. These ideas, held by both children and adults, are scientific concepts that are 'at variance with current scientific knowledge'" (p. 558). Confronting misconceptions is important when educating students to become literate in science (Kallery & Psillos, 2004; Rice, 2002).

Science Misconceptions

Abell (2008) examined 1,074 trade books with a nature theme; the majority only showed domestic animals, and the animal characters typically had human traits. Students do learn misconceptions from books (Atkinson et al., 2009; Kallery & Psillos, 2004; Sackes et al., 2009). In a study by Mayer (1995), 16 children were read a book about a whale and a little girl. The study showed that children remembered the incorrect

ideas rather than the correct information given by the whale, the main character, as he addressed the little girl's misconceptions (Mayer, 1995). In a follow-up study by Rice (2002), students changed their answers on a post-test to incorporate the information read to them from the book, even though it was incorrect.

Misconceptions may stem from poorly written books that contain confusing or wrong information. Confusing information also includes storytelling elements when students mix up the information presented by various characters (Rice, 2002). Often, questioning the author for fantasy or science fiction trade books effected student learning as teachers introduced and reinforced fantasy and science elements independently (Broemmel & Rearden, 2006; Sackes et al., 2009). Teachers need to have the pedagogical content necessary to review a trade book for accuracy and to decide whether the book is appropriate; only then can the children's book be used effectively (Schussler, 2008). Atkinson et al. (2009) reported that only a few veteran teachers choose science trade books effectively and with the use of outside resources; this insight was important because pre-service teachers often lack the content knowledge to select high-quality books. Smolkin et al. (2008) suggested elementary teachers and students have similar misconceptions. Trundle, Atwood, and Christopher's (2006) findings indicated pre-service teachers had similar misconceptions of the cause of moon phases when compared with a significant portion of the population. Because a book has a misconception does not mean it should not be used, but instead it should be evaluated and addressed in class discussions and activities. The book could be used later in the learning cycle as an evaluation tool or as a resource to teach students the importance of collecting facts and checking information.

Science can be a difficult subject to teach due to teachers' lack of content knowledge, students' lack of background knowledge, and increases in testing. The use of trade books is a way to incorporate teachers' familiarity with an instructional method and new content (Sackes et al., 2009). Trade books are recommended to teachers as a way to deliver science content in a more comfortable manner for those not confident about teaching the material (Rice, 2002; Schussler, 2008). Typically, pre-service teachers take only a few science courses and do not have the pedagogical content knowledge needed to teach science (Broemmel & Rearden, 2006; Rice, 2002). Trundle et al. (2006) concluded pre-service elementary teachers were not ready to teach moon content as indicated by National Science Teachers Association (NSTA). The resulting consequence of teachers completing only a few science courses is the potential selection and use of trade books with misconceptions or inaccuracies. This leads to the question, what happens if teachers select books that are inappropriate? As indicated by Mayer's (1995) and Rice's (2002) studies, students were likely to change their answers to incorporate new information even though the inaccurate information was corrected in the book. Students were reported to have remembered the inaccurate information.

Resources for High Quality Children's Literature

The *Teachers' Choices Booklists* from The International Reading Association and Children's Book Council are one resource available to teachers; the results from this project are available annually and include a list of approximately 30 books that can be used across the curriculum (Atkinson et al., 2009; Broemmel & Rearden, 2006). Broemmel and Rearden's study on the science quality of books on the *Teachers' Choices Booklists* found that none of the books selected from 1989 to 2004 contained

inaccurate science content, a few contained allusions to talking animals, and only a few were inappropriate for the intended grade level based on recommendations for science content by the NSTA (2006). Shelley (2007) introduced the Children's Book Council and NSTA's publication of an annual list titled *Outstanding Trade Books for Children* of the best children's science books; beginning in 2002 the list was expanded to include books appropriate for grades kindergarten through twelfth. The list is published online and in March issues of the NSTA's journals (Abell, 2008; Shelley, 2007). In 2010 and 2011, links to activities were added to complement the book selections on the NSTA website (NSTA, 2011).

Checklists and rubrics have been developed to evaluate science trade books (Atkinson et al., 2009; Schussler, 2008). Genre, content, and visual features need to be considered during evaluation of children's literature (Broemmel & Rearden, 2006; Shelley, 2007). Both content and visual features need to be accurate and interesting (Broemmel & Rearden, 2006).

Research Relevance

This study went beyond asking elementary students about their learning and asking elementary teachers to state whether a science fact is true or false. In this research study, elementary pre-service teachers were asked to identify misconceptions, a task more applicable to their future position in a school system that will require decisions involving books and lesson planning.

Chapter 3: Methodology

Study Design

This study was a descriptive research project, designed to investigate the science content knowledge of elementary education pre-service teachers at East Carolina University. This study consisted of book evaluations, an online survey, and teacher educator interviews. A reading teacher educator and a science teacher educator completed three book evaluations and participated in an interview. Elementary education pre-service teachers were asked to complete an online survey.

Setting and Participants

This research was conducted by a Master of Arts in Education in Elementary Education graduate student at East Carolina University; in accordance with university policy, an approval letter from the Institutional Review Board is located in Appendix A. This descriptive study took place at East Carolina University in Greenville, North Carolina, after it had been approved by the Interim Chair of the Department of Curriculum and Instruction; the Consent Form is located in Appendix B. Participants completing the survey were pre-service elementary education students enrolled in the course SCIE 3216: Teaching Science in the Elementary School in Spring 2011. Five sections of approximately 25 students in face to face instructional settings each were invited to complete the survey. The researcher visited a class meeting of each course section for approximately 10 minutes to invite participation and briefly demonstrate how to access the survey; a scripted version of the presentation is available in Appendix C. In addition to the scripted talk, the researcher answered any questions students had about the Informed Consent Form available in Appendix D. The five course sections

were selected based on instructors' willingness to participate and instructor support of asking their students to complete the online survey. The Instructor Consent Forms are located in Appendix E. Students completing the survey were described as a percentage of those asked to complete the survey. Demographics including gender, ethnicity, and class standing were used to describe survey participants.

Two teacher educators, one from the area of reading and the other in science, were asked to participate in the book evaluation and interview. The reading teacher educator was selected based on willingness to participate in the study. The science teacher educator was one of the course instructors of the selected student sections. The Informed Consent Form for these two teacher educators is available in Appendix F.

Procedures

Prior to asking students to complete the survey, a reading teacher educator and a science teacher educator were asked to complete a book evaluation using the given form, Science Trade Book Evaluation Rubric, available in Appendix G, to verify science misconceptions that may exist in the books selected for the student survey. Once the teacher educators consented and completed the book evaluation, an interview was conducted. Interview questions are available for review in Appendix H.

At the invitation of the university instructors, the researcher visited five sections of SCIE 3216: Teaching Science in the Elementary School to invite students to participate in completion of the online survey requiring 12-15 minutes of their time. During these 10 minutes of face-to-face time, the researcher reviewed and answered any questions about the Consent Form and demonstrated how to access the online survey. The researcher sent an e-mail to the course instructors with the URL of the

Action Research Project survey. The course instructors forwarded the message to students enrolled in each course section.

Data Sources

Rubric for book evaluation. The Science Trade Book Evaluation Rubric, available in Appendix G, was used to verify science misconceptions that may exist in the texts selected for use in the survey. This Science Trade Book Evaluation Rubric was developed and used by Atkinson et al. (2009) based on recommendations from the NSTA website on science trade book selection and trial assessments with books on the Teachers' Choices Booklists. Questions on this evaluation rubric included checkboxes for science content in the book and three basic science questions important for using the trade book to support science content. These three questions are meant to be read before reviewing the book: "Does the book have substantial science content (scientists at work and/or scientific information)?; Is the science content (text, scale, vocabulary, and graphics) accurate?; Is the science content current?" Following these questions, the rubric stated, "If the answer to any of the above three questions is "no," do not continue the evaluation." (Atkinson et al., 2009, p. 489). Also included on the book evaluation rubric were literacy-focused questions (Atkinson et al., 2009).

Teacher educator (reading and science) interviews. Two teacher educators were asked questions during a 30 minute interview, related to the recent trend of integrating content areas, misconceptions in children's books, experiences with misconceptions, science content knowledge of their students, and where to find appropriate resources. The specific questions and the list of potential follow-up questions are available in Appendix H.

Survey. Students completed the survey online through East Carolina University's survey system, Qualtrics. The survey began with an informed consent page, proceeded to three book excerpts with questions about each and finished with questions about using resources. A printed version of the survey is located in Appendix I. Each book excerpt page had a link to a video of the researcher reading the children's book. This ensured students had the opportunity to become familiar with the book before responding to questions about the book. A threat to the internal validity of this study was the attitude of subjects. If students were consciously aware that the researcher was studying their misconceptions in science, they may have chosen to use an outside resource to score better on the survey. To reduce this threat, questions were structured to ensure the answers given were reliable. Students were asked a question specifically about the text, then a fact, and then whether there was a misconception presented in the book and why they responded a certain way.

Data Collection

Rubric for book evaluation. Each teacher educator was given three rubrics to use in evaluating the chosen book excerpts. These were completed in a pen-and-paper format.

Teacher educator (reading and science) interviews. Each teacher educator consenting to participate was asked to sign an Informed Consent Form and participated in a 30 minute long audio recorded interview. The interviews were recorded and later transcribed and analyzed.

Survey. Surveys were collected through Qualtrics to measure the extent to which pre-service elementary education students recognized misconceptions in science trade

books and answered questions about the use of resources for selection of trade books. With the double-checking question format, the researcher intended to increase the reliability of participant answers. The addition of the linked videos of the researcher reading the book allowed for students to access the literature and feel comfortable responding to questions about the book.

Data Analysis

Rubric for book evaluation. The primary use for this data source was to verify the misconceptions in the selected books used in the survey. By confirming a misconception was in the text, the researcher validated the appropriateness of the book excerpts selected. If following instructions on the rubric, each of the books selected for use in the survey should not have had an evaluation completed beyond the initial three questions because each book had the answer of “no” to at least one of the questions. The average science and literacy scores were compared based on full completion of each evaluation. The completed rubrics are available for review in Appendix J.

The Tiny Seed (Carle, 1987) includes an illustration of a tiny seed being burned by the sun’s rays. This event is not possible because the seed would not be carried to that level of the atmosphere by the wind (Burnie, 2004). The seed would also not burst into flames as the book’s illustrations show. It is far more likely that the seed would not be able to germinate due to inadequate conditions (Brown, 2008). Seeds are not able to fly on their own as a bird can. Animals, wind, and water are all capable of transporting seeds (Brown, 2008; Burnie, 2004; Macken, 2008; Stone, 2008). In addition to these three methods of dispersal, Brown (2008) introduced self dispersal with the example of a pea pod; when the pod dries out, the peas are flung out.

In *The Mixed-Up Chameleon* (Carle, 1975), the text included language that implied chameleons change colors specifically to match their surroundings. Multiple experts (Cowley, 2005; Jenkins, 1997; Labella, 2005; Siwanowicz, 2009) explained that chameleons have the ability to expand and contract their pigment cells, displaying different intensities of color, as a way to express anger or body temperature, and do so more frequently for these reasons rather than as a way to camouflage from predators. LaBella's book, *Chameleons and Other Animals with Amazing Skin* (2005) included a photograph of a chameleon whose body temperature is lower and skin is darker. Another picture in the book was of the same chameleon with a warmer body temperature whose color was then a lighter green. The darker color allowed the chameleon to take in more heat from the sun's rays. Carle (1975) did show the chameleon's body temperature relationship with color in *The Mixed-Up Chameleon* when the chameleon became grey when he was cold and hungry. In *Chameleon, Chameleon* by Joy Cowley (2005), the author directly addressed the question of the reasoning for changing colors in the "Did you know?" section at the end of the narrative. Cowley (2005) stated only a few chameleons clearly change color and do so as a result of their mood; she mentioned specifically color darkening due to cold or an upset mood or brightening as a result of sleep. Jenkins's book, *Chameleons Are Cool* (1997) corroborated these facts. Siwanowicz (2009) mentioned colors do help with camouflage, but the main function was to communicate emotions. Cowley also introduced the idea that chameleons change color to impress the other gender and express their feelings towards other chameleons because chameleons do not hear well and use color to

communicate (2005). Chameleons change the intensity of their colors because the outermost layer of their skin is transparent (Siwanowicz, 2009).

In *Moon Bear* (Asch, 1978) the moon was colored yellow and changed in size. The book did not address the moon phases as a constant and consistent cycle and instead looked at the phases as the moon changing shapes. The moon does not change shapes (Olson, 2007; Simon, 2007). Rather the change observed from the earth is how much of the lit and unlit moon we see based on the location of us, the moon and sun (Olson, 2007; Simon, 2007). Olson (2007) explained that the sun always lights up half of the moon; however, inhabitants on earth are only able to see portions of the lighted moon during the cycle. The eight key moon phases are new moon, waxing crescent, first quarter, waxing gibbous, full moon, waning gibbous, third quarter, waning crescent, and then the new moon again where the cycle repeats itself.

Teacher educator (reading and science) interviews. Analysis for this data source occurred after both tapes had been recorded and transcribed. Coding was used to identify themes and trends. Notes were written for the interview with the science teacher educator, as the flip camera ran out of batteries two minutes into the interview. The science teacher educator read through and verified the notes after they were written. The interview transcription and notes are available in Appendix K.

Survey. Frequencies and percentages were used to describe and analyze the data from the surveys. For each book excerpt on the survey, the researcher looked at the data for students who correctly answered the true/false science content question. By sorting through data in this manner, the researcher was able to identify whether pre-service teachers knew the content and could then apply the content to a children's book

with misconceptions. Similarly, the question related to resources for guiding selection of trade books was examined to identify which resources were familiar and which ones had actually been used by survey respondents.

Limitations

There were several limitations to this study. The first was the generalizability of the study. The number of participants in this study was limited to those completing the survey in selected SCIE 3216 course sections. Not all pre-service elementary education students were invited to complete the survey nor were all reading and science teacher educators invited to participate in evaluating selected books and in the interview. By asking students to volunteer, the next limitation related to the sample. The sample was not random and was based on convenience. The sample size may not reflect the population studied.

Chapter 4: Findings

Rubric for Book Evaluation

The researcher did not expect the teacher educators to complete the evaluations fully because there was inaccurate content in the literature. Therefore the evaluations should not have been completed because the second evaluation question asked if the science content was accurate and was followed by a statement instructing the reader to not complete the evaluation if the content was inaccurate.

The reading and science teacher educators agreed on few ratings in the book evaluations. All evaluations were completed fully and are available in Appendix J. For *The Tiny Seed* (Carle, 1987), the science teacher educator wrote that most of the science content was inaccurate and proceeded to complete the evaluation even with the

typed statement indicating if an answer was no, then the evaluation should not be completed. Ratings for the science content in *The Tiny Seed* ranged from *no* (1) to *yes* (5). The reading teacher educator's average score for the science content was 4.7, between *recommended* and *superb*. The science teacher educator's average score for the science was 1.7 between *unacceptable* and *marginal*. Clearly their opinions for the science criteria were not aligned. The reading teacher educator wrote, "Students who have adults in their lives who garden, will understand and connect to this" marking a *yes* (5) on the scale, while the science teacher educator indicated a 2 to the content as an everyday endeavor, the very same question. The disagreement between the evaluations continued with the book ratings from a literacy perspective: the reading teacher educator's average score was 5 (*superb*) and the science teacher educator's was 3.7 (*use with caution to recommended*). According to the reading teacher educator, *The Tiny Seed* should be considered for classroom use because both scores were between 4 and 5; the opposite is true for the science teacher educator's evaluation. Both of the science teacher educator's scores indicated the book should be *used with caution* and carefully evaluated before classroom use. Table 1 displays each of the average science and literacy ratings for the three book evaluations completed by each of the teacher educators as well as the difference in scores.

Another stark contrast occurred in the evaluation of *The Mixed-Up Chameleon* (Carle, 1998). The science teacher educator's final average score for the science content was 1, *unacceptable*, whereas the reading teacher educator's science scores averaged to 3, *use with caution*. Literacy perspectives differed although not as greatly

as with the science content. The reading teacher educator’s average literacy score was 4.7 whereas the science teacher educator’s was 2.8.

Table 1

Average Science and Literacy Scores for Book Evaluations by Teacher Educators

	Reading Teacher Educator	Science Teacher Educator	Difference
Science Scores <i>The Tiny Seed</i>	4.7	1.7	3
Literacy Scores <i>The Tiny Seed</i>	5	3.4	2.4
Science Scores <i>The Mixed-Up Chameleon</i>	3	1	2
Literacy Scores <i>The Mixed-Up Chameleon</i>	4.7	2.8	1.9
Science Scores <i>Moon Bear</i>	3	2.7	.3
Literacy Scores <i>Moon Bear</i>	3.8	3.3	.5

The only book the teacher educators agreed upon was *Moon Bear* (Asch, 1978) where each agreed that the book should be *used with caution* based on the average value scores. The reading teacher educator stated, “It would only be appropriate in a study of how authors of fiction treat “the moon.” Both agreed that the content was presented as an everyday endeavor despite the marginalization of the moon; this indicates there a possibility to use this book in classroom instruction with additional

instruction on the specific science content because both agreed the book should be used with caution.

Teacher Educator (Reading and Science) Interviews

Having specific questions during the interviews allowed for themes to emerge. Both teacher educators had experiences with pre-service elementary education students lacking science content knowledge and proceeding to teach inaccurate information to students. The science teacher educator saw misconceptions more frequently in the form of lesson plans than the reading teacher educator who more frequently supervised pre-service students during their internships. Transcripts and notes from the interviews are available in Appendix K.

The science teacher educator had less experience with current research supporting integrating children's books into the science curriculum. According to the science teacher educator, when children's books were introduced, the lesson became more about the literacy content and the book rather than the science content and the teaching of science. The reading teacher educator found the trend of integrating children's literature into science to be "wonderful." The reading teacher educator reported having read research supporting the trend of integrating literature into science. Neither teacher educator provided specific examples of research supporting or disputing the current trend at the time of the interview.

Responses to the question, "How do you support integrating content areas in your classroom or with your students?" produced two different themes. The reading teacher educator fully supported the use of reading across the curriculum especially in science and social studies. The science teacher educator mentioned incorporating math

and social studies rather than reading. The same professional reported inviting guest speakers to class sessions but did not feel that those presentations were successful in enhancing science education content instruction. The science teacher educator emphasized integration of science with math and social studies rather than with reading.

Both teacher educators felt the misconceptions elementary pre-service teachers have are the result of a lack of content knowledge. The science teacher educator mentioned light and color, the water cycle, rocks, trees, plants, and animals as being common areas for elementary students and pre-service teachers to have misconceptions. The science teacher educator explained that science content and methods instruction was centered on misconceptions and using prior knowledge to find and correct student knowledge. Pre-service elementary education students were taught to identify elementary students' prior knowledge through the use of true/false questions, writings, and drawings, followed by asking elementary students what's wrong with an idea based on inquiry findings and returning to the prior knowledge/misconceptions to look for inconsistencies and correct the misconceptions. Pre-service teachers in the science educator's classroom were taught to go beyond simply correcting the misconception and instead addressing the misconception, the reasoning, and the misconception's relationship to other science knowledge.

Both teacher educators reported having concerns about inaccurate information and misconceptions being presented in children's books. The reading teacher educator mentioned the glossing over of topics in a manner very similar to what is done with social studies and history or the trend of "prettifying" the facts to make the story better. The science teacher educator mentioned that several pre-service teachers had shared

books and clips from YouTube. While neither teacher educator provided a specific example of an inaccurate trade book, the science teacher educator remembered the content of one particular book and song that stated the sun comes up in the day and the moon comes up at night with the implied conclusion being that neither the sun nor the moon can be seen at the same time. This fact is not true as shown by sunrise, sunset, moonrise, and moonset times; there are occasions when the moon can be seen in the middle of the day. Olson (2007) supported the fact the moon can be seen at various times of day with photographs.

An addition the reading teacher educator made to the conversation was the introduction of several accurate, quality trade books, mentioning specifically the Tree House series and publications such as *Your Big Backyard* by National Geographic. In addition to mentioning these titles, the importance of these trade books to children who are not interested in narrative fiction stories was stated; students who are struggling with reading may be intrigued by the content in non-fiction literature and therefore more motivated to read. This statement about increased motivation corresponded with research described in the current literature reviewed for the study (Brassell, 2006; Plummer & Kuhlman, 2008; Smolkin et al., 2008).

Two different themes emerged when the teacher educators were asked about counteracting the misconceptions presented in children's literature. The science teacher educator immediately suggested teaching to correct the misconception, while the reading teacher educator suggested a small group discussion based around the question, "Does this make sense?" Each teacher educator wanted the elementary students to bring in their own understandings and background knowledge to compare

with new knowledge. The science teacher educator approached it from a learning cycle perspective and wanted to gather student knowledge for the later stages of the learning cycle, elaboration and comparison. The reading teacher educator thought that locating inconsistencies in student knowledge would lead to an inquiry based discovery activity. Without knowing it, each of these teacher educators implied the same theme with a differing approach. In the end, each teacher educator suggested background knowledge was important and must be combined with inquiry learning to result in correct student learning and correction of misconceptions.

Overall, the reading teacher educator seemed more motivated to integrate science and literature based on statements about the trend being “wonderful” and the need to make science more than “something special done by men in white coats.” The reading teacher educator was familiar with specific examples of quality literature and familiar with book lists. The science teacher educator was more reluctant about the trend of integrating reading and science because it marginalized science and the focus became the literature rather than the science content. The teacher educators’ opinions on the integration of subjects are likely to affect pre-service teacher’s knowledge and thoughts on integration.

Regarding the research question for this study, the findings from the teacher educator interviews indicate that elementary education pre-service teachers who were not able to identify misconceptions probably do not have the content knowledge necessary to teach the science content or identify the misconception. Both teacher educators spoke of experiences with pre-service teachers lacking content knowledge and therefore having misconceptions.

Survey

The researcher invited 125 pre-service elementary education students enrolled in the course SCIE 3216: Teaching Science in the Elementary School to participate in the study. All students in on-campus sections of SCIE 3216 were invited to participate. Of the 125 invited, 63 agreed to participate. Of those who agreed to participate, 23 attempted and did not complete the survey. The completion mean was 72%. A total of 40 elementary education pre-service teachers completed the online survey for a response rate of 32%. Only results of completed surveys were used during data analysis.

Survey participants were 37 female and 3 male pre-service elementary education students at East Carolina University. The class rankings, as defined by East Carolina University, were as follows: four sophomores (10%), 31 juniors (78%), two seniors (5%), one graduate (3%), and two non-degree students (5%).

Survey analysis was completed by book excerpt, and data were evaluated based on the true/false science content questions. The true/false answer was not the information the researcher was looking for specifically and was instead used to get the interested information, whether students knew the content and could then apply their knowledge to each book's misconceptions.

The Tiny Seed. The true/false question from *The Tiny Seed* (Carle, 1987) was "Seeds can fly high enough to be burned by the sun." 93% of respondents answered false, the correct response. Of the 37 students who correctly answered the science content question, only 81% were able to correctly identify that the excerpt did not contain accurate science content. The excerpt was: "One of the seeds flies higher than

the others. Up, up it goes! It flies too high and the sun's hot rays burn it up" (Carle, 1987, p. 3). 14% selected "I don't know" and the remaining 5% selected "yes." This 19% gap represents an inability to transfer the content knowledge to the selected text.

Eighty-six percent of those students who knew the content as demonstrated by the true/false question could then identify there was a misconception in the text. Responses to the open-ended question requesting an explanation for the misconception were coded based on three themes: personal response, response to text, or included both. Personal responses did not include a specific reference to the text as the text responses did; an example of a text based response was "The misconception in this book is..." A response that included both directly referenced the text and included a personal opinion and was worded similar to "I think the misconception in the text was..." or contained a statement directly addressing the book followed by an opinion statement. Each of the response themes was then sub-divided based on common responses that occurred in each of the three categories. Table 2 includes a more detailed listing of coding findings. For example, eight students responded from personal experience that seeds cannot fly. Six of those students also indicated seeds cannot high enough to be burned by the sun, resulting in their response being coded in an additional two categories.

Seventeen of the 37 students reported that seeds could not fly high enough to be burned by the sun based on personal experience or misconceptions in the text. An example of a personal response that included these three codings (fly, high enough, and sun burning) is: "I'm not really sure if seeds can fly high enough to get burned up." An example of a text-based response that included these same three codings is: "The

misconception is that the seed can fly high in the air so the sun can burn it.” The second response provided the researcher with more information related to the research question. Over 80% of the students were able to identify and describe the science misconception in *The Tiny Seed* if they knew the science content.

Table 2

Numbers of Survey Respondents Answering Based on Personal Experience, Text Findings, or a Combination

Overall	Personal	Text	Both
Seeds do not fly.	8	2	0
Seeds cannot fly high enough.	9	8	0
The sun will burn the seed.	12	7	3
The seed cannot travel that distance.	1	1	1
Flowers cannot grow that large.	2	1	0
Number of respondents in category	21	12	4

The Mixed-Up Chameleon. The true/false content question for *The Mixed-Up Chameleon* (Carle, 1984) was “chameleons can change colors including white.” Initially, the researcher expected students to identify the content question as false. However, after further research, the researcher learned that chameleons can change to white although it is not common. It may have enhanced the study to have a different true/false content question, asking instead about the reasoning for the chameleon’s changing color.

Almost three-quarters of the students, 73%, knew chameleons could change colors (including changing to white). Of those 73%, 48% or 12 students indicated the

science content in the excerpt was not correct. There was possible confusion with the excerpt because it introduced the idea that the chameleon wanted to change into a polar bear. Of the 73% or 29 students who knew the content, only 55% were able to identify there was a misconception in the excerpt. Responses to the question requesting a reason were personal or text supported. Table 3 includes a more detailed list of personal and text supported responses.

Table 3

Numbers of Survey Respondents Answering Based on Personal Experience, Text Findings, or a Combination

Overall	Personal	Text	Both
Polar Bear reference	3	3	3
Change color	11	1	3
Can be white	9	2	0
Reasoning	3	1	0
Change into other animals	2	0	1
Number of respondents in category	20	5	4

Nine students (31%) referenced the chameleon’s attempt to change into a polar bear and stated this was a misconception because an animal cannot change into another species. Eleven students (38%) responded with a personal remark that chameleons can change colors; some responses included exclamation points and displayed confidence. Nine students (31%) stated that a chameleon could be white from personal experience. Four students (14%) addressed the reasoning for color changed;

of those four, all four suggested camouflage as the reasoning behind the chameleon's ability to change colors. One of the four students who suggested camouflage also mentioned he/she was unsure as to whether chameleons could change colors when they were hungry. Another student who did not mention camouflage wrote, "I am not sure if a chameleon is able to turn white or not. I do know that chameleons do change colors some, but I don't believe it is the whole spectrum of colors." This response was the most detailed and addressed the misconception in the book as well as the respondent's own understandings.

Only 12 (41%) survey respondents were able to correctly answer the content question and identify the misconception. Based on what the researcher learned from analyzing this question, the researcher would have changed the excerpt to the first pages of the text where the chameleon changes colors to camouflage with his surroundings and asked about the implied reasoning for the chameleon's change of colors.

Moon Bear. The true/false question for *Moon Bear* (Asch, 1978) was "the moon has different phases because the Earth's shadow blocks part of the sun." The book did not specifically address the Earth's shadow as the cause of the phases; however, the question was helpful in determining basic science content knowledge. *Moon Bear's* illustrations showed the moon as yellow, changing in size, and moving through the phases rapidly. Sixteen students (40%) answered the true/false question correctly. Of those 16 students, only 9 (56%) stated the science content was inaccurate in the book. In contrast, 13 of those 16 students identified a misconception in the book. Table 4 displays the personal and text responses respondents provided when asked for an

explanation of the science content misconception. Five responses to the question requesting an explanation were personal; of those five, four mentioned the cause of the moon's phases as not being the Earth's shadow thus demonstrating a lack of knowledge about the book because the true/false question did not come specifically from the book as the previous true/false questions.

Table 4

Numbers of Survey Respondents Answering Based on Personal Experience or Text Connections

Overall	Personal	Text
Cause not Earth's shadow	4	2
Pace of phases	0	2
Anthropomorphism	0	1
Moon's size	0	2
Number of responses	5	11

Eleven students (69%) had responses which directly addressed misconceptions in the book. Two students mentioned the pace of the moon's phases in the book as a misconception. An additional student mentioned the anthropomorphism in the book shown by the talking birds. Two other students mentioned the moon's size in the context of the book stating the moon does not grow and shrink although it looks that way in the book. Of the 56% who based their responses on the book, only one offered a correct reasoning for the moon's phases. The student stated the misconception is, "that the earth blocks the sun and causes the moon phases but it is really the orbit of the moon

and its tilted orbit that cause the moon phases and certain parts of the moon to be seen.” This student was able to identify the misconception in the children’s book. Overall most participants were not able to identify the misconception in science content during a review of *Moon Bear* (Asch, 1978).

For purposes of comparison, the researcher viewed student responses to the explanation of the science misconception question for those not answering the true/false question correctly. These 24 students responded to the book on a more personal level and focused specifically on the anthropomorphism rather than the moon’s role in the book. One student wrote, “bears do not wear glass and birds do not talk.” These types of statements may have demonstrated a deflection of the unfamiliar content and return to familiar content; the disconnect between the science content suggested by the true/false questions and the science misconceptions was apparent in student responses. This reaction was more common to this *Moon Bear* (Asch, 1978) excerpt when compared to the other books.

Resources. Resources to be consulted when preparing an integrated reading and science unit are the *Teachers’ Choices* booklists and the NSTA Recommends website; each of these resources contains lists of high-quality children’s literature in the areas of science and literacy (Broemmel & Rearden, 2006; NCSTA, 2011). Table 5 shows student familiarity and use of real and made up resources and organizations.

Student knowledge and use of these resource sites and organizations was low; the Outstanding Trade Books for Children site was familiar to four (10%) students and had only been used by one (3%). The numbers were slightly better for the Children’s Book Council, one of the organizations supporting the *Teachers’ Choices* booklists, 11

(28%) had heard of the organization and 5 (13%) had used their resources. The resource organization students were most familiar with was the East Carolina Teaching Resources Center (ECU TRC) with 40 (100%) survey respondents acknowledging they were familiar with the center and 38 (95%) stating they had used it before.

Table 5

Survey Respondents Report of Use and Familiarity with Resources/Organizations

Resource/Organization ^a	Heard of	Used
American Library Association	10	4
Children’s Book Council	11	5
Children’s List of Great Books	6	7
East Carolina University Teaching Resources Center (ECU TRC)	40	38
Integrating Reading and Science Journal	4	2
National Science Teachers Association	14	4
North Carolina Science Teachers Association	12	3
NC Teacher Academy Lesson Plans	1	0
Outstanding Science Trade Books for Children	4	1
Positively Great Science Books	2	1
Science and Children	5	2

Note: Not all of the listed resources/organizations actually exist.

^a The Children’s List of Great Books, Integrating Reading and Science Journal, and Positively Great Science Books are not current resources or organizations. The

researcher used these names to determine the reliability of the other data in this question.

Chapter 5: Conclusions

Purpose of Study

The purpose of this study was to describe current pre-service teachers' knowledge of science misconceptions in selected excerpts from trade books.

Results

Identification of misconceptions by pre-service elementary education teachers was affected by the science content in each book excerpt. Fewer students (40%) were able to correctly answer the science content for the moon question than for the chameleon (73%) or seed (94%) content questions. When students were unsure of the content, their answers focused on fantasy elements and anthropomorphism that lead to confusion in content understanding by students as shown by the responses to the misconceptions in *The Tiny Seed* (Carle, 1987) and *Moon Bear* (Asch, 1978); anthropomorphism refers to describing inanimate objects with human thoughts, feelings, and reasoning (Kallery & Psillos, 2004).

This study verified Trundle et al.'s (2006) findings that pre-service elementary teachers were not ready to teach moon content as indicated by the National Science Teachers Association (NSTA). Only 39% were able to correctly answer the true/false content question, "The moon has different phases because the Earth's shadow blocks part of the sun." Of those 39%, only 40% were able to identify the fact that the book contained inaccurate science content. As science education becomes more prominent and emphasized in schools and standardized testing, it is necessary for both teachers

of pre-service elementary education students as well as elementary teachers to be aware of their misconceptions and ability to identify a misconception.

The impact of these findings will make current pre-service elementary teacher educators aware of the importance of addressing misconceptions and will emphasize the importance of pre-reading a book before using it in the classroom. After completing this project it would be important for the researcher to study science content before teaching science units and to evaluate each potentially used trade book to identify the proper location in the 5E model for book. It is important to note that a book has a misconception it should not necessarily be eliminated from the classroom; the book can be used to evaluate student knowledge and to teach students to question an author and think critically about the content in a book.

One suggestion for expanding awareness of the quality book lists published by professional organizations is to incorporate these book lists and suggested literature from the sites into the ECU TRC because it was the most popular and used organization by East Carolina University pre-service elementary education students. Promoting these resources and making the books available in the ECU TRC will assist pre-service teachers as they acquire content knowledge and teaching methods. In addition, both of these quality literature websites should be introduced in reading and science methods courses as shown by the low percentages of students who were familiar or had used the resources.

Implications

From these results, the researcher concluded that pre-service elementary teachers' knowledge of science misconceptions falls into two general categories, those

knowing the content and able to identify the misconception and those who are unsure of the content and are not able to consistently identify misconceptions related to different science content areas. An area for further study would be the correlation between the category of identifying misconceptions and students who decide and choose to become teachers rather than not thinking of the decision and simply becoming a teacher. For those interested in this research, this would be an appropriate follow-up study.

The results from this study impact several perspectives. Teacher educators of college students have additional content to teach related to science misconceptions in trade books, while current elementary teachers could view this study as important to their own education. Current teachers could focus on the books used in their science instruction for accuracy and content presentation using the evaluation rubric in Appendix G. Teacher educators actively teaching could also demonstrate the use of a trade book evaluation rubric to pre-service teachers and address misconceptions through their courses.

Describing current pre-service teacher knowledge of science misconceptions made the researcher more aware of the content to be taught and the need to address science misconceptions in the elementary classroom. It is important to teach children about questioning content in books and looking for other resources to verify information. For parents, the content they may believe (for example, moon phases) may not match information presented in class. Students will need to be taught how to decide what information is correct, what resources are valid, and whether findings presented are reliable.

This study has implications for the field of teacher education as a whole and may be seen as eye-opening once data are analyzed. There was a gap in the ability for students to transfer content knowledge to the presentation of information in books thus demonstrating that a link is missing between content knowledge and application. Methods courses for science education need to be developed further and evaluated with respect to teacher content knowledge before and after instruction. In addition, pre-service teachers must be able to apply the content knowledge they know in the evaluation of a trade book. Teacher content knowledge influences student learning. With this study, the researcher clarified that pre-service teachers do not always have accurate science content knowledge to identify misconceptions presented in trade books; their knowledge in different areas of science varies greatly.

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Appendices

Appendix A: IRB Approval Letter

Appendix B: Consent Form, Interim Chair

Appendix C: Scripted talk for SCIE 3216 Classroom Visit

Appendix D: Informed Consent Form, Student

Appendix E: Consent Form, Course Instructors

Appendix F: Informed Consent Form, Teacher Educator

Appendix G: Science Trade Book Evaluation Rubric

Appendix H: Questions for Teacher Educator Interviews

Appendix I : Student Survey

Appendix J : Completed Book Evaluations

Appendix K : Interview Transcriptions and Notes

Appendix A: IRB Approval Letter



EAST CAROLINA UNIVERSITY

University & Medical Center Institutional Review Board Office
1L-09 Brody Medical Sciences Building • 600 Moye Boulevard • Greenville, NC 27834
Office 252-744-2914 • Fax 252-744-2284 • www.ecu.edu/irb

TO: Heather Wiles, 400 West First St., Apt. 234B, Greenville, NC 27834
FROM: UMCIRB KK
DATE: February 16, 2011
RE: Expedited Category Research Study
TITLE: "Trade Books in Elementary Education: Misconception in Science"

UMCIRB #11-092

This research study has undergone review and approval using expedited review on 2.15.11. This research study is eligible for review under an expedited category number 6 & 7. The Chairperson (or designee) deemed this **unfunded** study **no more than minimal risk** requiring a continuing review in **12 months**. Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a continuing review/closure application to the UMCIRB prior to the date of study expiration. The investigator must adhere to all reporting requirements for this study.

The above referenced research study has been given approval for the period of **2.15.11 to 2.14.12**. The approval includes the following items:

- Internal Processing Form (dated 1.13.11)
- Informed consent: Professor & Students (received 2.15.11)
- Letters of Support
- Survey
- Scripted Talk for SCIE 3216 Classroom Visit
- Questions for Professors Interview
- Science Trade Book Evaluation Rubric

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

The UMCIRB applies 45 CFR 46, Subparts A-D, to all research reviewed by the UMCIRB regardless of the funding source. 21 CFR 50 and 21 CFR 56 are applied to all research studies under the Food and Drug Administration regulation. The UMCIRB follows applicable International Conference on Harmonisation Good Clinical Practice guidelines.

Appendix B: Consent Form, Interim Chair

Dr. Carolyn Ledford, Interim Chair
Department of Curriculum and Instruction
East Carolina University
Greenville, NC 27858

December 1, 2010

Dear Dr. Ledford,

Heather Wiles is working on her Masters of Arts in Education degree in Elementary Education at East Carolina University. She has just completed ELEM 6000 *Professional Development, Issues and Trends in Elementary Education*, a required course where students plan individual action research projects to be completed and presented in another course later in their program. As part of a course assignment, Heather Wiles has developed an action research plan to be implemented as an online survey at East Carolina University. This plan must be submitted and approved by a campus Institutional Review Board before it can be implemented; your permission for the plan is part of that review process.

Please review the action research proposal and sign the bottom of this form if completing this action research project titled, Trade Books in Elementary Education: Misconceptions in Science meets with your approval.

Sincerely,

Patricia J. Anderson, Ed.D.
Teacher educator

Interim Chair's Signature and Date:

I am aware, and I give consent for Heather Wiles to conduct Trade Books in Elementary Education: Misconceptions in Science, an action research project at East Carolina University.

Signature

Date

Appendix C: Scripted talk for SCIE 3216 Classroom Visit

Length: approximately 10 minutes

Scripted

“Hello, my name is Heather Wiles and I’m presently working on my Master’s of Elementary Education at East Carolina University.

Today, I’m going to mention my purpose for visiting your class, introduce the informed consent form, and review the format of the online survey you will be invited to complete as well as describe the procedures for completing the survey.

As part of my degree requirements, I am planning an educational action research project that will help me learn more about elementary pre-service teachers and their knowledge of science misconceptions identified in trade books.

To do this, I’m inviting you to complete an online survey that I have designed. This survey will take approximately 12-15 minutes and is based on picture book excerpts. I’ve brought the books with me today and you are welcome to look through them. [pass out books] Please be sure I get all three of the books back. In addition to being available today, the online survey has 3 links to videos, one for each book, of me reading the text should you wish to hear and see the book before responding to any questions.

The survey begins with an informed consent document. Should you wish to participate in this study, you must indicate this by typing your name in the box. The informed consent document details risks and benefits associated with this study. [show informed consent document]

Once you provide consent, there are 3-4 questions about each of the 3 book excerpts. The majority of the questions are multiple choice or multiple answer. At the end of the survey are two questions about science book resources.

So, how do you access this survey? After class today, I’m going to e-mail your course instructor with a link to the survey, he/she will then forward it on to you. My contact information is available through your course instructor and on the informed consent form should you have further questions about the survey or results.

Do you have any questions?”

Answer questions as asked.

Appendix D: Informed Consent Form, Student



Unique Identifier: Trade Books in Elementary Education: Misconceptions



Dear Student,

My name is Heather Wiles and I'm presently working on my Master's of Elementary Education at East Carolina University. As part of my degree requirements, I am planning an educational action research project that will help me learn more about elementary pre-service teachers and their knowledge of science misconceptions identified in trade books. Please read the information below, and if you give consent to participate, type your name in the box below.

Thank you!

Informed Consent to Participate in Research

Information to consider before taking part in research that has no more than minimal risk.

Title of Research Study: Trade Books in Elementary Education: Misconceptions in Science

Principal Investigator: Heather Wiles

Institution/Department or Division: College of Education/ Curriculum & Instruction

Address: 400 West First Street Apt 234B, Greenville, NC 27834

Telephone #: 919-971-7431

Researchers at East Carolina University (ECU) in the College of Education are interested in studying school and educational issues. Our goal is to try to find ways to improve the lives of students and teachers.

You may have questions that this form does not answer. You may have questions later and you should ask those questions, as you think of them. There is no time limit for asking questions about this research.

You do not have to take part in this research. Take your time and think about the information that is provided. If you choose to participate in the study, then you should sign the form when you are comfortable that you understand the information provided. If you do not want to take part in the study, you should not sign this form. That decision is yours and it is okay to decide not to volunteer.

Why is this research being done?

The purpose of this research study is to describe whether pre-service elementary teachers are able to identify science misconceptions in trade books.

Why am I being invited to take part in this research?

You are being asked to participate because you are a member of a class chosen by the researcher.

Are there reasons I should not take part in this research?

This research presents no foreseen risks for you.

Where is the research going to take place and how long will it last?

This research is being conducted through an on-line survey requiring approximately 12-15 minutes of your time. The survey will be available for two weeks beginning February 15 and remaining available until March 1, 2011.

What will I be asked to do?

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TO 2.14.12

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Parent's Initials

You will be asked to complete an online survey requiring approximately 12-15 minutes of your time. Signing this consent form simply gives the researcher permission to collect and analyze data for their ECU graduate course using confidential means.

What possible harms or discomforts might I experience if I take part in the research?

No risks are anticipated from taking part in this study. As this study is for educational research purposes only, the results of the survey **will not** affect your grade.

What are the possible benefits I may experience from taking part in this research?

There may be no personal benefit for your participation, but the information gained by doing this research may help others in the future and contributing to the knowledge base about teaching and learning.

How will you keep the information you collect about me secure? How long will you keep it?

Your responses will be kept completely confidential. Data will be stored for one year and then shredded by the researcher.

What if I decide I do not want to continue in this research?

Your participation is completely voluntary; you are free to withdraw at any time. If you decide that you do not want to continue, you can simply notify the Principal Investigator.

Who should I contact if I have questions?

The Principal Investigator and her course instructors will be available to answer any questions concerning this research, now or in the future. You may contact the Principal Investigator at 919-971-7431 (Monday through Friday between 8:00 am and 5:00 pm) or through email at wilesh10@students.ecu.edu or contact the course instructors, Dr. Patricia Anderson (andersonp@ecu.edu) at 252-328-4123, or Dr. Brian Housand (housandb@ecu.edu) at 252-737-2484 (Monday through Friday between 8:00 am and 5:00 pm). If you have additional questions about your rights as someone taking part in research, you may call the UMCIRB Office at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, you may call the Director of UMCIRB Office, at 252-744-1971.

I agree to take part in this research. What should I do now?

Please read the following and if you agree, you should sign this form:

- I have read (or had read to me) all of the above information.
- I have had an opportunity to ask questions about things in this research I did not understand and have received satisfactory answers.
- I understand that I can stop taking part in this study at any time.
- By signing this informed consent form, I am not giving up any of my rights.
- I realize I can request a copy of this document by contacting the Principal Investigator or course instructor.

Student Name (PRINT)	Signature	Date
----------------------	-----------	------

Person Obtaining Informed Consent: I have conducted the initial informed consent process. I have answered all of the person's questions about the research.

Person Obtaining Consent (PRINT)	Signature	Date
----------------------------------	-----------	------

UMCIRB Number: 11-092

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Appendix E: Consent Form, Course Instructors



College of Education
Department of Curriculum and Instruction
East Carolina University
Speight Building • Greenville, NC 27858-4353
252-328-6181 office • 252-328-2585 fax
www.coe.ecu.edu

Ms. Tammy Lee
East Carolina University
Flanagan 311
Greenville, NC 27858

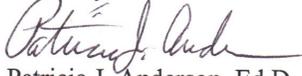
December 1, 2010

Dear Ms. Lee,

Heather Wiles is working on her Masters of Arts in Education degree in Elementary Education at East Carolina University. She has just completed ELEM 6000 *Professional Development, Issues and Trends in Elementary Education*, a required course where students plan individual action research projects to be completed and presented in another course later in their program. As part of a course assignment, Heather Wiles has developed an action research plan to be implemented as an online survey at East Carolina University. This plan must be submitted and approved by a campus Institutional Review Board before it can be implemented; your permission for the plan is part of that review process.

Please review the action research proposal and sign the bottom of this form if completing this action research project titled, *Trade Books in Elementary Education: Misconceptions in Science* meets with your approval.

Sincerely,


Patricia J. Anderson, Ed.D.
Professor

Course Instructor's Signature and Date:

I am aware, and I give consent for Heather Wiles to conduct *Trade Books in Elementary Education: Misconceptions in Science*, an action research project at East Carolina University.

Signature

Date

Appendix F: Informed Consent Form, Teacher Educator



Unique Identifier: Trade Books in Elementary Education: Misconceptions



Dear Professor,

My name is Heather Wiles and I'm presently working on my Master's of Elementary Education at East Carolina University. As part of my degree requirements, I am planning an educational action research project that will help me learn more about elementary pre-service teachers and their knowledge of science misconceptions identified in trade books. Please read the information below, and if you give consent to participate, please sign on the second page of this document.

Thank you!

Informed Consent to Participate in Research

Information to consider before taking part in research that has no more than minimal risk.

Title of Research Study: Trade Books in Elementary Education: Misconceptions in Science

Principal Investigator: Heather Wiles

Institution/Department or Division: College of Education/ Curriculum & Instruction

Address: 400 West First Street Apt 234B, Greenville, NC 27834

Telephone #: 919-971-7431

Researchers at East Carolina University (ECU) in the College of Education are interested in studying school and educational issues. Our goal is to try to find ways to improve the lives of students and teachers.

You may have questions that this form does not answer. You may have questions later and you should ask those questions, as you think of them. There is no time limit for asking questions about this research.

You do not have to take part in this research. Take your time and think about the information that is provided. If you choose to participate in the study, then you should sign the form when you are comfortable that you understand the information provided. If you do not want to take part in the study, you should not sign this form. That decision is yours and it is okay to decide not to volunteer.

Why is this research being done?

The purpose of this research study is to describe whether pre-service elementary teachers are able to identify science misconceptions in trade books.

Why am I being invited to take part in this research?

You are being asked to participate because your area of specialty is in reading or science.

Are there reasons I should not take part in this research?

This research presents no foreseen risks for you.

Where is the research going to take place and how long will it last?

This research is being conducted through an on-line survey requiring approximately 12-15 minutes. The survey will be available for two-three weeks beginning February 15 and remaining available until March 1, 2011.

What will I be asked to do?

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You will be asked to complete three evaluations of children's trade books using a science trade book evaluation rubric. You will also be asked to participate in an interview lasting approximately 15-30 minutes. This interview will be audio-recorded, so that the researcher may go back and transcribe the interview. Signing this consent form simply gives the researcher permission to collect and analyze data for their ECU graduate course using confidential means.

What possible harms or discomforts might I experience if I take part in the research?

No risks are anticipated from taking part in this study.

What are the possible benefits I may experience from taking part in this research?

There may be no personal benefit for your participation, but the information gained by doing this research may help others in the future and contributing to the knowledge base about teaching and learning.

How will you keep the information you collect about me secure? How long will you keep it?

Your responses will be kept completely confidential. Data will be stored for one year and then shredded by the researcher.

What if I decide I do not want to continue in this research?

Your participation is completely voluntary; you are free to withdraw at any time. If you decide that you do not want to continue, you can simply notify the Principal Investigator.

Who should I contact if I have questions?

The Principal Investigator and her course instructors will be available to answer any questions concerning this research, now or in the future. You may contact the Principal Investigator at 919-971-7431 (Monday through Friday between 8:00 am and 5:00 pm) or through email at wilesh10@students.ecu.edu or contact the course instructors, Dr. Patricia Anderson (andersonp@ecu.edu) at 252-328-4123, or Dr. Brian Housand (housandb@ecu.edu) at 252-737-2484 (Monday through Friday between 8:00 am and 5:00 pm). If you have additional questions about your rights as someone taking part in research, you may call the UMCIRB Office at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, you may call the Director of UMCIRB Office, at 252-744-1971.

I agree to take part in this research. What should I do now?

Please read the following and if you agree, you should sign this form:

- I have read (or had read to me) all of the above information.
- I have had an opportunity to ask questions about things in this research I did not understand and have received satisfactory answers.
- I understand that I can stop taking part in this study at any time.
- By signing this informed consent form, I am not giving up any of my rights.
- I realize I can request a copy of this document by contacting the Principal Investigator or course instructor.

Student Name (PRINT)

Signature

Date

Person Obtaining Informed Consent: I have conducted the initial informed consent process. I have answered all of the person's questions about the research.

UMCIRB Number: 11-092

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Parent's Initials

Title of Study: Trade Books in Elementary Education: Misconceptions in Science

Person Obtaining Consent (PRINT)

Signature

Date

UMCIRB Number: 11-092

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Parent's Initials

Appendix G: Science Trade Book Evaluation Rubric

Figure 1
Science Trade Book Evaluation Rubric

Book title:		Author:				
ISBN:	Copyright date:	Out of print ___ Yes ___ No (If out of print, carefully attend to whether science content is current.)				
Science content of book: (Check all that apply.) <input type="checkbox"/> Details professional scientists(s) engaged in inquiry <input type="checkbox"/> Facts/Concepts <input type="checkbox"/> Presents science through an engaging/enjoyable story <input type="checkbox"/> Details "how to" experiments						
Before reviewing the book, answer these three questions: 1. Does the book have substantial science content (scientists at work and/or scientific information)? 2. Is the science content (text, scale, vocabulary, and graphics) accurate? 3. Is the science content current? If the answer to any of the above three questions is "no," do not continue the evaluation.						
Science criteria						
Is the book's science content presented "as an everyday endeavor" so that students can connect it with some of their own experiences or so that they can participate as "scientists in the making" (i.e., pose "I wonder" questions or explore further)?		5 Yes	4 Somewhat	3 Somewhat	2 Somewhat	1 No
Comments:						
Is the book's science content personalized by putting a human face on science practice (presenting scientific inquiry/discovery "in action" through engaging narratives, showing specific inquiry skills in action by "expert scientists")?		5 Yes	4 Somewhat	3 Somewhat	2 Somewhat	1 No
Comments:						
Is the book's science content intellectually and developmentally appropriate for its audience?		5 Yes	4 Somewhat	3 Somewhat	2 Somewhat	1 No
Comments:						
Literacy Criteria—framed to fit fiction/nonfiction genres						
Complete either A or B.						
A. Fiction: Does the plot exhibit good development, imagination, and continuity? Are the characters (if any) well developed?		5 Excellent	4	3	2	1 Poor
B. Nonfiction: Does the book's content include adequate information presented in a clearly organized and appropriate text structure?		5 Excellent	4	3	2	1 Poor
Comments:						
Does the book contain a vivid and interesting writing style that actively involves the reader?		5 Excellent	4	3	2	1 Poor
Comments:						

(continued)

Figure 1 (continued)
Science Trade Book Evaluation Rubric

Are the book's illustrations and graphics text-relevant, appealing, and representative of a child's perspective?	5	4	3	2	1
	Excellent			Poor	
Comments:					
Are the book's readability and interest level developmentally appropriate for its intended audience?	5	4	3	2	1
	Excellent			Poor	
Comments:					
Do the book's content information, style, graphics/illustrations, and story/text structure complement one another?	5	4	3	2	1
	Excellent			Poor	
Comments:					
<u>For nonfiction only:</u> Do access features (table of contents, index, heading, sidebars, glossary, author's notes, bibliographies, epilogues, captions, etc.), offer additional information that explains, extends, or verifies information in the book?	5	4	3	2	1
	Excellent			Poor	
Comments:					
Does the book respect the reader by presenting positive ethical and cultural values, especially inclusive of gender and racial representation? (If not applicable, omit this item from scoring)	5	4	3	2	1
	Excellent			Poor	
Comments:					
Final reviewer evaluation:					
1. Average the scores for this review related to Science Criteria; repeat for Literacy Criteria.					
2. Select values below based upon the average of scores from the Science Criteria and followed by the Literacy Criteria. Round each score to a tenth of a point.					
Rating of this book from a science perspective:	5	4	3	2	1
	Superb	Recommended	Use With Caution	Marginal	Unacceptable
Rating of this book from a literacy perspective:	5	4	3	2	1
	Superb	Recommended	Use With Caution	Marginal	Unacceptable
Comments:					
Directions for considering scores for this book across all reviewers:					
1. Average final value science scores for all reviewers (preferably three, at least one with science expertise).					
2. Average final value literacy scores for all reviewers.					
3. Final average science _____/Final average literacy_____					
To be considered for classroom use, a book should receive final average scores in the 4–5 range for science and in the 4–5 range for literacy.					
Note. Rubric by Terry Atkinson, Lisa Huber, and Melissa Matusevich, adapted with permission from Hunsader, P.D. (2004). Mathematics trade books: Establishing their value and assessing their quality. <i>The Reading Teacher</i> , 57(7), 618–629.					

Appendix H: Questions for Teacher Educator Interviews

Approximate Time Required: 15-30 minutes

Review informed consent form and ask for questions.

Define terminology as used in my study.

Trade Books. Trade books refer to books published for and available to the general public; these books may be purchased in book stores and can be found at local libraries. Trade books are available in a wide variety of genres including non-fiction, fiction, and poetry.

Misconception. A science misconception is a thought stemming from incorrect or confusing information. Often misconceptions are formed as a way to answer a question about the world around us. Misconceptions can be advanced through reading literature or in classroom settings; misconceptions can be corrected in a classroom setting and by reading accurate literature.

Ask questions. Diamond bullets will be asked when appropriate as follow-up questions.

- What is your opinion on the recent trend of integrating children's books into the science curriculum?
 - ❖ Have you read any research that supports continued use of this trend?
What about research that disputes this trend as successful?
 - ❖ How do you support integrating content areas in your classroom?
 - ❖ Have you had any experiences with a pre-service elementary education student who inaccurately taught science content? Would you consider his or her mistake to have been based on a content misconception? (No names will be mentioned.)

- Have you thought about inaccurate information/misconceptions being presented in children's books?
- Have you encountered any experiences with a particular trade book presenting a misconception?
 - ❖ Do you have any examples of books that present or confirm science misconceptions?
 - ❖ If you were to use this book in your classroom, what would you do to counteract the misconception presented? Would you change the book's position in the 5E Learning Cycle?

Appendix I: Student Survey

Q1



Informed Consent

Dear Student,

My name is Heather Wiles and I'm presently working on my Master's of Elementary Education at East Carolina University. As part of my degree requirements, I am planning an educational action research project that will help me learn more about elementary pre-service teachers and their knowledge of science misconceptions identified in trade books. Please read the information below, and if you give consent to participate, type your name in the box below.

Thank you!

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Information to consider before taking part in research that has no more than minimal risk.

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Principal Investigator: Heather Wiles

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Address: 400 West First Street Apt 234B, Greenville, NC 27834

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UMCIRB Approved from 2.15.11 to 2.14.12

UMCIRB Number: 11-092

UMCIRB Version 2008.08.15

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Why is this research being done? The purpose of this research study is to describe whether pre-service elementary teachers are able to identify science misconceptions in trade books.

Why am I being invited to take part in this research?

You are being asked to participate because you are a member of a class chosen by the researcher.

Are there reasons I should not take part in this research?

This research presents no foreseen risks for you.

Where is the research going to take place and how long will it last?

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What will I be asked to do?

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What are the possible benefits I may experience from taking part in this research?

There may be no personal benefit for your participation, but the information gained by doing this research may help others in the future and contributing to the knowledge base about teaching and learning.

How will you keep the information you collect about me secure? How long will you keep it?

Your responses will be kept completely confidential. Data will be stored for one year and then shredded by the researcher.

What if I decide I do not want to continue in this research?

Your participation is completely voluntary; you are free to withdraw at any time. If you decide that you do not want to continue, you can simply notify the Principal Investigator.

Who should I contact if I have questions?

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I agree to take part in this research. What should I do now?

Please read the following and if you agree, you should sign this form by typing your name in the box below:

- I have read (or had read to me) all of the above information.
- I have had an opportunity to ask questions about things in this research I did not understand and have received satisfactory answers.
- I understand that I can stop taking part in this study at any time.
- By checking this informed consent form, I am not giving up any of my rights.
- I realize I can request a copy of this document by contacting the Principal Investigator or course instructor

Q2

If you would like to see a video of the researcher reading this book aloud, please click play.

The Tiny Seed by Eric Carle

The following questions refer to the text below.

"One of the seeds flies higher than the others. Up, up it goes! It flies too high and the sun's hot rays burn it up. But the tiny seed sails on with the others."

Is the science content accurate?

- Yes
- No
- I don't know

Q3

True/False. Seeds can fly high enough to be burned by the sun.

- True
- False

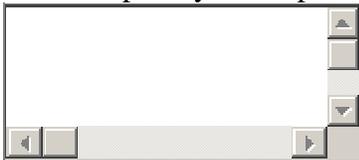
Q4

Please refer to the excerpted text from *The Tiny Seed* by Eric Carle given above. Based on your current knowledge of the book and content, is there is a misconception in this excerpt?

- There is a misconception in this excerpt.
- There is not a misconception in this excerpt.
- I don't know.

Q5

Please explain your response to the question directly above about *The Tiny Seed*.



Q6

If you would like to see a video of the researcher reading this book aloud, please click play.

The Mixed Up Chameleon by Eric Carle
The following questions refer to the text below.

"The chameleon thought:
How small I am, how slow, how weak!"

I wish I could be big and white like a polar bear.
And the chameleon's wish came true.
But was it happy?
No!"

The illustration on this page shows a white chameleon. Include this knowledge in your answers to the questions.

Is the science content accurate?

- Yes
- No
- × I don't know

Q7

True/False. Chameleons can change colors including white.

- True
- False

Q8

Please refer to the excerpted text from *The Mixed Up Cameleon* by Eric Carle given above. Based on your current knowledge of the book and content, is there is a misconception in this excerpt?

- There is a misconception in this excerpt.
- There is not a misconception in this excerpt.
- I don't know.

Q9

Please explain your response to the question directly above about *The Mixed Up Cameleon*.

Q10

If you would like to see a video of the researcher reading this book aloud, please click play.

Book: Moon Bear by Frank Asch

Note: these questions are about the moon phase illustrations in Moon Bear.

Is the science content accurate?

- Yes
- No
- I don't know.

Q11

True/False. The moon has different phases because the Earth's shadow blocks part of the sun.

- True
- False

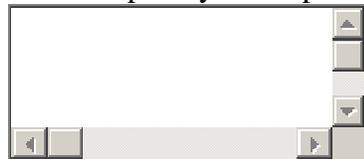
Q12

Please refer to the illustrations from Moon Bear by Frank Asch given in the video. Based on your current knowledge of the book and content, is there is a misconception in this excerpt?

- There is a misconception in this book.
- There is not a misconception in this book.
- I don't know.

Q13

Please explain your response to the question directly above about Moon Bear.



Q14

True/False. You will never see a shadow at noon.

- True
- False

Q15

Please check the resources and/or organizations you have heard of.

- American Library Association
- Children's Book Council
- Children's List of Great Books
- East Carolina University Teaching Resources Center (ECU TRC)
- Integrating Reading and Science Journal
- National Science Teachers Association
- NC Science Teachers Association
- NC Teacher Academy Lesson Plans
- Outstanding Science Trade Books for Children
- Positively Great Science Books
- Science and Children

Q16

Please check the resources and/or organizations you have used.

- American Library Association
- Children's Book Council
- Children's List of Great Books
- East Carolina University Teaching Resources Center (ECU TRC)
- Integrating Reading and Science Journal
- National Science Teachers Association
- NC Science Teachers Association
- NC Teacher Academy lesson plans
- Outstanding Science Trade Books for Children
- Positively Great Science Books
- Science and Children

Q17

Demographic Information

Note: This is the last page of the survey.

Please specify your gender.

- Male
- Female

Q18

Please select your class ranking as classified by ECU.

- Freshman
- Sophomore
- Junior
- Senior
- Graduate
- Non-Degree Seeking

Q19

Please choose the time your SCIE 31216 class meets.

- Monday & Wednesday, 9 am -10:45 am
- Monday & Wednesday 11am -12:45 pm
- Monday & Wednesday 1 pm - 2:45 pm
- Tuesday & Thursday 9 am - 10:45 am
- Tuesday & Thursday 11 am - 12:45 pm

Appendix J: Book Evaluation Rubrics

Figure 1
Science Trade Book Evaluation Rubric

Book title: <u>The Tiny Seed</u>		Author: <u>Eric Carle</u>				
ISBN: <u>0-88708-015-4</u>		Copyright date: <u>1987</u>				
		Out of print <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (If out of print, carefully attend to whether science content is current.)				
Science content of book: (Check all that apply.)						
<input type="checkbox"/> Details professional scientists(s) engaged in inquiry		<input type="checkbox"/> Facts/Concepts				
<input checked="" type="checkbox"/> Presents science through an engaging/enjoyable story		<input type="checkbox"/> Details "how to" experiments				
Before reviewing the book, answer these three questions:						
1. Does the book have substantial science content (scientists at work and/or scientific information)? <u>yes</u>						
2. Is the science content (text, scale, vocabulary, and graphics) accurate? <u>some yes, a lot no</u>						
3. Is the science content current? <u>yes?</u>						
If the answer to any of the above three questions is "no," do not continue the evaluation. <u>?</u>						
Science criteria						
Is the book's science content presented "as an everyday endeavor" so that students can connect it with some of their own experiences or so that they can participate as "scientists in the making" (i.e., pose "I wonder" questions or explore further)?		5	4	3	2	1
		Yes	Somewhat	No		
Comments:						
Is the book's science content personalized by putting a human face on science practice (presenting scientific inquiry/discovery "in action" through engaging narratives, showing specific inquiry skills in action by "expert scientists")?		5	4	3	2	1
		Yes	Somewhat	No		
Comments:						
Is the book's science content intellectually and developmentally appropriate for its audience?		5	4	3	2	1
		Yes	Somewhat	No		
Comments:						
Literacy Criteria—framed to fit fiction/nonfiction genres						
Complete either A or B.						
A. Fiction: Does the plot exhibit good development, imagination, and continuity? Are the characters (if any) well developed?		5	4	3	2	1
		Excellent			Poor	
B. Nonfiction: Does the book's content include adequate information presented in a clearly organized and appropriate text structure?		5	4	3	2	1
		Excellent			Poor	
Comments:						
Does the book contain a vivid and interesting writing style that actively involves the reader?		5	4	3	2	1
		Excellent			Poor	
Comments:						

(continued)

Figure 1 (continued)
Science Trade Book Evaluation Rubric

Are the book's illustrations and graphics text-relevant, appealing, and representative of a child's perspective?	5	4	3	2	1
	Excellent				Poor
Comments:					
Are the book's readability and interest level developmentally appropriate for its intended audience?	5	4	3	2	1
	Excellent				Poor
Comments:					
Do the book's content information, style, graphics/illustrations, and story/text structure complement one another?	5	4	3	2	1
	Excellent				Poor
Comments:					
For nonfiction only: Do access features (table of contents, index, heading, sidebars, glossary, author's notes, bibliographies, epilogues, captions, etc.), offer additional information that explains, extends, or verifies information in the book?	5	4	3	2	1
	Excellent				Poor
Comments:					
Does the book respect the reader by presenting positive ethical and cultural values, especially inclusive of gender and racial representation? (If not applicable, omit this item from scoring)	5	4	3	2	1
	Excellent		n/a		Poor
Comments:					
Final reviewer evaluation:					
1. Average the scores for this review related to Science Criteria; repeat for Literacy Criteria.					
2. Select values below based upon the average of scores from the Science Criteria and followed by the Literacy Criteria. Round each score to a tenth of a point.					
Rating of this book from a science perspective:	5	4	3	2	1
	Superb	Recommended	Use With Caution	Marginal	Unacceptable
Rating of this book from a literacy perspective:	5	4	3	2	1
	Superb	Recommended	Use With Caution	Marginal	Unacceptable
Comments:					
Directions for considering scores for this book across all reviewers:					
1. Average final value science scores for all reviewers (preferably three, at least one with science expertise).					
2. Average final value literacy scores for all reviewers.					
3. Final average science <u>1.07</u> / Final average literacy <u>3.4</u>					
To be considered for classroom use, a book should receive final average scores in the 4-5 range for science and in the 4-5 range for literacy.					
Note. Rubric by Terry Atkinson, Lisa Huber, and Melissa Matusevich, adapted with permission from Hunsader, P.D. (2004). Mathematics trade books: Establishing their value and assessing their quality. <i>The Reading Teacher</i> , 57(7), 618-629.					

Figure 1
Science Trade Book Evaluation Rubric

Book title: <i>The Tiny Seed</i>		Author: <i>Eric Carle</i>	
ISBN: <i>0-88708-05-4</i>	Copyright date: <i>1987</i>	Out of print <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (If out of print, carefully attend to whether science content is current.)	
Science content of book: (Check all that apply.) <input type="checkbox"/> Details professional scientists(s) engaged in inquiry <input checked="" type="checkbox"/> Facts/Concepts <input checked="" type="checkbox"/> Presents science through an engaging/enjoyable story <input type="checkbox"/> Details "how to" experiments			
Before reviewing the book, answer these three questions: 1. Does the book have substantial science content (scientists at work and/or scientific information)? <i>Yes.</i> 2. Is the science content (text, scale, vocabulary, and graphics) accurate? <i>Yes.</i> 3. Is the science content current? <i>Yes.</i> If the answer to any of the above three questions is "no," do not continue the evaluation.			
Science criteria			
Is the book's science content presented "as an everyday endeavor" so that students can connect it with some of their own experiences or so that they can participate as "scientists in the making" (i.e., pose "I wonder" questions or explore further)?		<i>5</i>	4 3 2 1 Yes Somewhat No
Comments: <i>Students, who have adults in their lives who garden, will understand & connect w/ this!</i>			
Is the book's science content personalized by putting a human face on science practice (presenting scientific inquiry/discovery "in action" through engaging narratives, showing specific inquiry skills in action by "expert scientists")?		5	<i>4</i> 3 2 1 Yes Somewhat No
Comments: <i>No specific inquiry skills here but there is an engaging line of discovery!</i>			
Is the book's science content intellectually and developmentally appropriate for its audience?		<i>5</i>	4 3 2 1 Yes Somewhat No
Comments:			
Literacy Criteria—framed to fit fiction/nonfiction genres			
Complete either A or B.			
A. Fiction: Does the plot exhibit good development, imagination, and continuity? Are the characters (if any) well developed?		<i>5</i>	4 3 2 1 Excellent Poor
B. Nonfiction: Does the book's content include adequate information presented in a clearly organized and appropriate text structure?		<i>5</i>	4 3 2 1 Excellent Poor
Comments: <i>It also uses exquisite art media & techniques! while "illustrating" the challenges facing seeds!</i>			
Does the book contain a vivid and interesting writing style that actively involves the reader?		<i>5</i>	<i>4</i> 3 2 1 Excellent Poor
Comments: <i>Yes; among other traits, it builds suspense re: seed's outcome!</i>			

(continued)

Figure 1 (continued)
Science Trade Book Evaluation Rubric

Are the book's illustrations and graphics text-relevant, appealing, and representative of a child's perspective?	5	4	3	2	1
	Excellent				Poor
Comments: <i>Appeal includes environment, as well as people. i.e. setting + characters!</i>					
Are the book's readability and interest level developmentally appropriate for its intended audience?	5	4	3	2	1
	Excellent				Poor
Comments:					
Do the book's content information, style, graphics/illustrations, and story/text structure complement one another?	5	4	3	2	1
	Excellent				Poor
Comments:					
For nonfiction only: Do access features (table of contents, index, heading, sidebars, glossary, author's notes, bibliographies, epilogues, captions, etc.), offer additional information that explains, extends, or verifies information in the book?	5	4	3	2	1
	Excellent				Poor
Comments:					
Does the book respect the reader by presenting positive ethical and cultural values, especially inclusive of gender and racial representation? (If not applicable, omit this item from scoring)	5	4	3	2	1
	Excellent				Poor
Comments: <i>It includes a healthy, cultural mix!</i>					
Final reviewer evaluation:					
1. Average the scores for this review related to Science Criteria; repeat for Literacy Criteria.					
2. Select values below based upon the average of scores from the Science Criteria and followed by the Literacy Criteria. Round each score to a tenth of a point.					
Rating of this book from a science perspective:	5	4	3	2	1
	Superb	Recommended	Use With Caution	Marginal	Unacceptable
Rating of this book from a literacy perspective:	5	4	3	2	1
	Superb	Recommended	Use With Caution	Marginal	Unacceptable
Comments: <i>Did "we" expect less from Eric Carle ??!!</i>					

Directions for considering scores for this book across all reviewers:

1. Average final value science scores for all reviewers (preferably three, at least one with science expertise).
2. Average final value literacy scores for all reviewers.
3. Final average science 4.7 / Final average literacy 5

To be considered for classroom use, a book should receive final average scores in the 4-5 range for science and in the 4-5 range for literacy.

Note. Rubric by Terry Atkinson, Lisa Huber, and Melissa Matusevich, adapted with permission from Hunsader, P.D. (2004). Mathematics trade books: Establishing their value and assessing their quality. *The Reading Teacher*, 57(7), 618-629.

Figure 1
Science Trade Book Evaluation Rubric

Book title: <i>The Mixed Up Chameleon</i>		Author: <i>Eric Carle</i>	
ISBN: <i>0-694-01147-9</i>		Copyright date: <i>1975, 1998</i>	
		Out of print ___ Yes <input checked="" type="checkbox"/> No (If out of print, carefully attend to whether science content is current.)	
Science content of book: (Check all that apply.)			
<input type="checkbox"/> Details professional scientists(s) engaged in inquiry		<input type="checkbox"/> Facts/Concepts	
<input checked="" type="checkbox"/> Presents science through an engaging/enjoyable story		<input type="checkbox"/> Details "how to" experiments	
Before reviewing the book, answer these three questions:			
1. Does the book have substantial science content (scientists at work and/or scientific information)? <i>Yes</i>			
2. Is the science content (text, scale, vocabulary, and graphics) accurate? <i>Yes</i>			
3. Is the science content current? <i>Yes</i>			
If the answer to any of the above three questions is "no," do not continue the evaluation.			
Science criteria			
Is the book's science content presented "as an everyday endeavor" so that students can connect it with some of their own experiences or so that they can participate as "scientists in the making" (i.e., pose "I wonder" questions or explore further)?		5 4 3 2 1 Yes Somewhat No	
Comments: <i>The chameleon wants to be someone other than itself!</i>			
Is the book's science content personalized by putting a human face on science practice (presenting scientific inquiry/discovery "in action" through engaging narratives, showing specific inquiry skills in action by "expert scientists")?		5 4 3 2 1 Yes Somewhat No	
Comments: <i>—</i>			
Is the book's science content intellectually and developmentally appropriate for its audience?		5 4 3 2 1 Yes Somewhat No	
Comments: <i>The chameleon changes color in the first pages, but the addition of body parts is fiction</i>			
Literacy Criteria—framed to fit fiction/nonfiction genres			
Complete either A or B.			
A. Fiction: Does the plot exhibit good development, imagination, and continuity? Are the characters (if any) well developed?		5 4 3 2 1 Excellent Poor	
B. Nonfiction: Does the book's content include adequate information presented in a clearly organized and appropriate text structure?		5 4 3 2 1 Excellent Poor	
Comments:			
Does the book contain a vivid and interesting writing style that actively involves the reader?		5 4 3 2 1 Excellent Poor	
Comments: <i>Sentences are one-liners. Some lines are repetitive to encourage prediction skills!</i>			

(continued)

Figure 1 (continued)
Science Trade Book Evaluation Rubric

Are the book's illustrations and graphics text-relevant, appealing, and representative of a child's perspective?	5 Excellent	4	3	2	1 Poor
Comments: <i>They include color, texture & imagination</i>					
Are the book's readability and interest level developmentally appropriate for its intended audience?	5 Excellent	4	3	2	1 Poor
Comments:					
Do the book's content information, style, graphics/illustrations, and story/text structure complement one another?	5 Excellent	4	3	2	1 Poor
Comments:					
For nonfiction only: Do access features (table of contents, index, heading, sidebars, glossary, author's notes, bibliographies, epilogues, captions, etc.), offer additional information that explains, extends, or verifies information in the book?	5 Excellent	4	3	2	1 Poor
Comments:					
Does the book respect the reader by presenting positive ethical and cultural values, especially inclusive of gender and racial representation? (If not applicable, omit this item from scoring)	5 Excellent	4	3	2	1 Poor
Comments: <i>It supports a positive view of self, which is a cultural value (U.S.)</i>					
Final reviewer evaluation:					
1. Average the scores for this review related to Science Criteria; repeat for Literacy Criteria.					
2. Select values below based upon the average of scores from the Science Criteria and followed by the Literacy Criteria. Round each score to a tenth of a point.					
Rating of this book from a science perspective:	5 Superb	4 Recommended	3 Use With Caution	2 Marginal	1 Unacceptable
Rating of this book from a literacy perspective:	5 Superb	4.7 Recommended	4 Use With Caution	3 Marginal	2 Unacceptable
Comments:					
Directions for considering scores for this book across all reviewers:					
1. Average final value science scores for all reviewers (preferably three, at least one with science expertise).					
2. Average final value literacy scores for all reviewers.					
3. Final average science <u>3</u> / Final average literacy <u>4.7</u>					
To be considered for classroom use, a book should receive final average scores in the 4-5 range for science and in the 4-5 range for literacy.					
Note. Rubric by Terry Atkinson, Lisa Huber, and Melissa Matusevich, adapted with permission from Hunsader, P.D. (2004). Mathematics trade books: Establishing their value and assessing their quality. <i>The Reading Teacher</i> , 57(7), 618-629.					

Figure 1
Science Trade Book Evaluation Rubric

Book title: <i>The Mixed Up Chameleons</i> Author: <i>Eric Carle</i>	
ISBN: <i>0-694-01147-9</i>	Copyright date: <i>1975, 1998</i>
Out of print ___ Yes <input checked="" type="checkbox"/> No (If out of print, carefully attend to whether science content is current.)	
Science content of book: (Check all that apply.) <input type="checkbox"/> Details professional scientists(s) engaged in inquiry <input type="checkbox"/> Facts/Concepts <input checked="" type="checkbox"/> Presents science through an engaging/enjoyable story <input type="checkbox"/> Details "how to" experiments	
Before reviewing the book, answer these three questions: 1. Does the book have substantial science content (scientists at work and/or scientific information)? <i>no</i> 2. Is the science content (text, scale, vocabulary, and graphics) accurate? <i>very little</i> 3. Is the science content current? <i>?</i> If the answer to any of the above three questions is "no," do not continue the evaluation.	
Science criteria	
Is the book's science content presented "as an everyday endeavor" so that students can connect it with some of their own experiences or so that they can participate as "scientists in the making" (i.e., pose "I wonder" questions or explore further)?	5 4 3 2 1 Yes Somewhat No <input checked="" type="radio"/>
Comments:	
Is the book's science content personalized by putting a human face on science practice (presenting scientific inquiry/discovery "in action" through engaging narratives, showing specific inquiry skills in action by "expert scientists")?	5 4 3 2 1 Yes Somewhat No <input checked="" type="radio"/>
Comments:	
Is the book's science content intellectually and developmentally appropriate for its audience?	5 4 3 2 1 Yes Somewhat No <input checked="" type="radio"/>
Comments:	
Literacy Criteria—framed to fit fiction/nonfiction genres	
Complete either A or B.	
A. Fiction: Does the plot exhibit good development, imagination, and continuity? Are the characters (if any) well developed?	5 4 3 2 1 Excellent Poor <input checked="" type="radio"/>
B. Nonfiction: Does the book's content include adequate information presented in a clearly organized and appropriate text structure?	5 4 3 2 1 Excellent Poor
Comments:	
Does the book contain a vivid and interesting writing style that actively involves the reader?	5 4 3 2 1 Excellent Poor <input checked="" type="radio"/>
Comments:	

(continued)

Figure 1 (continued)
Science Trade Book Evaluation Rubric

Are the book's illustrations and graphics text-relevant, appealing, and representative of a child's perspective?	5	4	3	2	1
	Excellent			Poor	
Comments:					
Are the book's readability and interest level developmentally appropriate for its intended audience?	5	4	3	2	1
	Excellent			Poor	
Comments: <i>older group of young children?</i>					
Do the book's content information, style, graphics/illustrations, and story/text structure complement one another?	5	4	3	2	1
	Excellent			Poor	
Comments:					
For nonfiction only: Do access features (table of contents, index, heading, sidebars, glossary, author's notes, bibliographies, epilogues, captions, etc.), offer additional information that explains, extends, or verifies information in the book?	5	4	3	2	1
	Excellent			Poor	
Comments:					
Does the book respect the reader by presenting positive ethical and cultural values, especially inclusive of gender and racial representation? (If not applicable, omit this item from scoring)	5	4	3	2	1
	Excellent			Poor	
Comments:					
Final reviewer evaluation:					
1. Average the scores for this review related to Science Criteria; repeat for Literacy Criteria.					
2. Select values below based upon the average of scores from the Science Criteria and followed by the Literacy Criteria. Round each score to a tenth of a point.					
Rating of this book from a science perspective:	5	4	3	2	1
	Superb	Recommended	Use With Caution	Marginal	Unacceptable
Rating of this book from a literacy perspective:	5	4	3	2	1
	Superb	Recommended	Use With Caution	Marginal	Unacceptable
Comments:					

Directions for considering scores for this book across all reviewers:

1. Average final value science scores for all reviewers (preferably three, at least one with science expertise).
2. Average final value literacy scores for all reviewers.
3. Final average science 1 / Final average literacy 2.8

To be considered for classroom use, a book should receive final average scores in the 4-5 range for science and in the 4-5 range for literacy.

Note. Rubric by Terry Atkinson, Lisa Huber, and Melissa Matusevich, adapted with permission from Hunsader, P.D. (2004). Mathematics trade books: Establishing their value and assessing their quality. *The Reading Teacher*, 57(7), 618-629.

Figure 1
Science Trade Book Evaluation Rubric

Book title: <u>Man Bear</u>		Author: <u>Frank Asch</u>		
ISBN: <u>0-684-15810-8</u>	Copyright date: <u>1978</u>	Out of print <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (If out of print, carefully attend to whether science content is current.)		
Science content of book: (Check all that apply.) <input type="checkbox"/> Details professional scientists(s) engaged in inquiry <input checked="" type="checkbox"/> Facts/Concepts <input checked="" type="checkbox"/> Presents science through an engaging/enjoyable story <input type="checkbox"/> Details "how to" experiments				
Before reviewing the book, answer these three questions: 1. Does the book have substantial science content (scientists at work and/or scientific information)? <i>Yes</i> 2. Is the science content (text, scale, vocabulary, and graphics) accurate? <i>Yes</i> 3. Is the science content current? <i>Yes</i> If the answer to any of the above three questions is "no," do not continue the evaluation.				
Science criteria				
Is the book's science content presented "as an everyday endeavor" so that students can connect it with some of their own experiences or so that they can participate as "scientists in the making" (i.e., pose "I wonder" questions or explore further)?		5 Yes	4 Somewhat	3 2 1 No
Comments: <u>The moon waxes & wanes!</u>				
Is the book's science content personalized by putting a human face on science practice (presenting scientific inquiry/discovery "in action" through engaging narratives, showing specific inquiry skills in action by "expert scientists")?		5 Yes	4 Somewhat	3 2 1 No
Comments: <u>The moon's phases are marginalized.</u>				
Is the book's science content intellectually and developmentally appropriate for its audience?		5 Yes	4 Somewhat	3 2 1 No
Comments: <u>It would only be appropriate in a study of how authors of fiction treat "the moon."</u>				
Literacy Criteria—framed to fit fiction/nonfiction genres				
Complete either A or B.				
A. Fiction: Does the plot exhibit good development, imagination, and continuity? Are the characters (if any) well developed?		5 Excellent	4 3	2 1 Poor
B. Nonfiction: Does the book's content include adequate information presented in a clearly organized and appropriate text structure?		5 Excellent	4 3	2 1 Poor
Comments: <u>We see bears as somewhat ignorant & anxious</u>				
Does the book contain a vivid and interesting writing style that actively involves the reader?		5 Excellent	4 3	2 1 Poor
Comments: <u>It's a predictably patterned style emphasizing the need to help one another, search for help, etc.</u>				

(continued)

Figure 1 (continued)
Science Trade Book Evaluation Rubric

Are the book's illustrations and graphics text-relevant, appealing, and representative of a child's perspective?	5 Excellent	4	3	2	1 Poor
Comments: <i>They are soft, gentle drawings that are not distracting; easy to focus for young readers/listeners</i>					
Are the book's readability and interest level developmentally appropriate for its intended audience?	5 Excellent	4	3	2	1 Poor
Comments: <i>for preschoolers!</i>					
Do the book's content information, style, graphics/illustrations, and story/text structure complement one another?	5 Excellent	4	3	2	1 Poor
Comments:					
For nonfiction only: Do access features (table of contents, index, heading, sidebars, glossary, author's notes, bibliographies, epilogues, captions, etc.), offer additional information that explains, extends, or verifies information in the book?	5 Excellent	4	3	2	1 Poor
Comments:					
Does the book respect the reader by presenting positive ethical and cultural values, especially inclusive of gender and racial representation? (If not applicable, omit this item from scoring)	5 Excellent	4	3	2	1 Poor
Comments: <i>NA</i>					
Final reviewer evaluation: 1. Average the scores for this review related to Science Criteria; repeat for Literacy Criteria. 2. Select values below based upon the average of scores from the Science Criteria and followed by the Literacy Criteria. Round each score to a tenth of a point.					
Rating of this book from a science perspective:	5 Superb	4 Recommended	3 Use With Caution	2 Marginal	1 Unacceptable
Rating of this book from a literacy perspective:	5 Superb	4 Recommended	3.8 Use With Caution	2 Marginal	1 Unacceptable
Comments:					

Directions for considering scores for this book across all reviewers:

1. Average final value science scores for all reviewers (preferably three, at least one with science expertise).
2. Average final value literacy scores for all reviewers.
3. Final average science 3 / Final average literacy 3.8

To be considered for classroom use, a book should receive final average scores in the 4-5 range for science and in the 4-5 range for literacy.

Note. Rubric by Terry Atkinson, Lisa Huber, and Melissa Matusevich, adapted with permission from Hunsader, P.D. (2004). Mathematics trade books: Establishing their value and assessing their quality. *The Reading Teacher*, 57(7), 618-629.

Figure 1
Science Trade Book Evaluation Rubric

Book title: <u>Moun Bear</u>		Author: <u>Frank Asch</u>	
ISBN: <u>0-684-15810-8</u>		Copyright date: <u>1978</u>	
		Out of print <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (If out of print, carefully attend to whether science content is current.)	
Science content of book: (Check all that apply.)			
<input type="checkbox"/> Details professional scientists(s) engaged in inquiry		<input type="checkbox"/> Facts/Concepts	
<input checked="" type="checkbox"/> Presents science through an engaging/enjoyable story		<input type="checkbox"/> Details "how to" experiments	
Before reviewing the book, answer these three questions:			
1. Does the book have substantial science content (scientists at work and/or scientific information)? <u>no</u>			
2. Is the science content (text, scale, vocabulary, and graphics) accurate? <u>somewhat</u>			
3. Is the science content current? <u>yes</u>			
If the answer to any of the above three questions is "no," do not continue the evaluation. <u>no</u>			
Science criteria			
Is the book's science content presented "as an everyday endeavor" so that students can connect it with some of their own experiences or so that they can participate as "scientists in the making" (i.e., pose "I wonder" questions or explore further)?		5 <u>4</u> 3 2 1 Yes Somewhat No	
Comments:			
Is the book's science content personalized by putting a human face on science practice (presenting scientific inquiry/discovery "in action" through engaging narratives, showing specific inquiry skills in action by "expert scientists")?		5 4 3 2 <u>1</u> Yes Somewhat No	
Comments:			
Is the book's science content intellectually and developmentally appropriate for its audience?		5 4 <u>3</u> 2 1 Yes Somewhat No	
Comments:			
Literacy Criteria—framed to fit fiction/nonfiction genres			
Complete either A or B.			
A. Fiction: Does the plot exhibit good development, imagination, and continuity? Are the characters (if any) well developed?		5 <u>4</u> 3 2 1 Excellent Poor	
B. Nonfiction: Does the book's content include adequate information presented in a clearly organized and appropriate text structure?		5 4 3 2 1 Excellent Poor	
Comments:			
Does the book contain a vivid and interesting writing style that actively involves the reader?		5 4 <u>3</u> 2 1 Excellent Poor	
Comments:			

(continued)

Figure 1 (continued)
Science Trade Book Evaluation Rubric

Are the book's illustrations and graphics text-relevant, appealing, and representative of a child's perspective?	5	4	3	2	1
	Excellent				Poor
Comments:					
Are the book's readability and interest level developmentally appropriate for its intended audience?	5	4	3	2	1
	Excellent				Poor
Comments: <i>intended audience is very, very young?</i>					
Do the book's content information, style, graphics/illustrations, and story/text structure complement one another?	5	4	3	2	1
	Excellent				Poor
Comments:					
For nonfiction only: Do access features (table of contents, index, heading, sidebars, glossary, author's notes, bibliographies, epilogues, captions, etc.), offer additional information that explains, extends, or verifies information in the book?	5	4	3	2	1
	Excellent				Poor
Comments:					
Does the book respect the reader by presenting positive ethical and cultural values, especially inclusive of gender and racial representation? (If not applicable, omit this item from scoring)	5	4	3	2	1
	Excellent				Poor
Comments:					
Final reviewer evaluation:					
1. Average the scores for this review related to Science Criteria; repeat for Literacy Criteria.					
2. Select values below based upon the average of scores from the Science Criteria and followed by the Literacy Criteria. Round each score to a tenth of a point.					
Rating of this book from a science perspective:	5	4	3	2	1
	Superb	Recommended	Use With Caution	Marginal	Unacceptable
Rating of this book from a literacy perspective:	5	4	3	2	1
	Superb	Recommended	Use With Caution	Marginal	Unacceptable
Comments:					

Directions for considering scores for this book across all reviewers:

1. Average final value science scores for all reviewers (preferably three, at least one with science expertise).
2. Average final value literacy scores for all reviewers.
3. Final average science 2.7 / Final average literacy 3.3

To be considered for classroom use, a book should receive final average scores in the 4-5 range for science and in the 4-5 range for literacy.

Note. Rubric by Terry Atkinson, Lisa Huber, and Melissa Matusevich, adapted with permission from Hunsader, P.D. (2004). Mathematics trade books: Establishing their value and assessing their quality. *The Reading Teacher*, 57(7), 618-629.

Appendix K: Transcriptions and Notes

Interview with Reading Teacher Educator

H: So, some of the terminology used in my study. I define trade books. Trade books refer to books published for and available to the general public; these books may be purchased in book stores and can be found at local libraries. Trade books are available in a wide variety of genres including non-fiction, fiction, and poetry. As you probably already know.

R: Of course,

H: Not everyone does. A science misconception is a thought stemming from incorrect or confusing information. Often misconceptions are formed as a way to answer a question about the world around us. Misconceptions can be advanced through reading literature or in classroom settings; misconceptions can be corrected in a classroom setting and by reading accurate literature. Does that make sense?

R: Yes, it does.

H: Alright

R: Very thorough.

H: What is your opinion on the recent trend of integrating children's books into the science curriculum?

R: I love it. It's so important. Science is usually something that is special and only men in white coats do, so its wonderful.

H: Have you read any research that supports continued use of this trend?

R: Oh, yes. Its abundant.

H: Can you think of any examples?

R: Oh, no. Not a title off of my head.

H: That's fine. What about research that disputes this trend as successful?

R: I try not to read that kind. Because I'm very pro science in the elementary curriculum especially.

H: How do you support integrating content areas in your classroom or with your students?

R: Oh, I talk it up big every chance I can get. My field is phonics so that lends itself to reading across the curriculum and that definitely includes content areas such as science and social studies.

H: Have you had any experiences with a pre-service elementary education student who inaccurately taught science content?

R: Yes, ma'am.

H: Would you consider his or her mistake to have been based on a content misconception? No names will be mentioned.

R: I'm not so sure it was a content misconception as it was an inaccurate or deficit science background, herself.

H: So then when she went to teach it she didn't have the background knowledge to teach.

R: No, she didn't. That's exactly right. And when I questioned it in the follow-up conversation, she was angry.

H: Oh, wow

R: Yes.

H: Ok. Have you thought about inaccurate information or misconceptions being presented in children's books?

R: Yes, I have. Because things are glossed over. Its every similar to activity with social studies and history, that the facts are prettified to make a good story and not necessarily always accurate. It's not true for all texts and all books. It does present itself in many.

H: Ok. Have you encountered any experiences with a particular trade book presenting a misconception?

R: Um, no not that I add to your conversation off the top of my head. I was thinking of ones that really do present facts well

H: Uh, huh.

R: like the Tree House series.

H: Are there any others that do present facts well?

R: That one comes to mind because I read tend to read those with my grandchildren. And also the publications that come from National Geographic. I know like *Your Big Backyard* which is so good for struggling readers, like K-2. That's all very scientific.

H: Is that because its more non-fiction and they like to read the...

R: Yes.

H: You don't have to decipher?

R: Yes, that's exactly right. But even when they have little stories, and I'm thinking then about the upper level kids that may read Ranger Rick those always have facts that are historical context.

H: Ok.

R: Fiction context, not historical. Sorry.

H: If you were to use this book in your classroom, what would you do to counteract the misconception presented?

R: Oh, I would have a small group discussion about, you know, does this make sense. Have the kids bring in their own understandings and hopefully be able to get rid of the misconceptions that they bring in their background knowledge. That's part of it too. They come with misconceptions about how the world works and if they see them affirmed in a classroom or in a text, then they've got them for life, or nearly for life. It's hard to undo.

H: Yes, so you take what they know and re-think it with what's presented and then decide what's accurate.

R: Exactly. Let them decide or then it leads them right into a discovery activity to see what the real true is or see what really happens.

H: Anything else you want to add?

R: No, that's fine.

.....
R: ...It was 3rd grade. And it was like I was thinking you're not saying what I hear you saying.

H: Was she teaching the moon and solar system?

R: Yeah, that can be part of that. I can't even remember what it was. It was more science health related, you know, more like anatomy. I was like oh no. So, I didn't even charge her with it when we were talking about it. I always start with "tell me how the day felt to you. How did you like it?" she gave it to me. I agreed with her because you know they're always positives. Well, tell me about this. And she kind of looked and I said well

could we have looked at it different way to make it more accurate. She was a fit. She was a fit. [table slap] You're gonna go out there and be awful. I can tell.

H: No, you need to know.

R: yeah, this once upon a time.

H: Especially with the moon in 3rd grade. The moon and the solar system. 3rd grade. Big things happen

R: I know, I know. I heard one yesterday in Farmville. Also 3rd grade She was talking about rays and line segments in math. I'm thinking oh good, bring in the outside world, text to self.

H: Text to text

H & R: Text to world

R: Exactly. Text to text. So, she says like the sun's rays. You could have asked the children where they had heard rays before. She's big on telling right now instead of asking. So, that's another thing we're working on. She's improved in the last month. But,

H: That's good.

R: Yeah. So anyway, the rays. The sun's rays come to Earth, and they come to Japan, and they come to the ocean, and they even come to Farmville. And she went on. So, I was like the sun's rays are concentrated and just come to Earth?

H: No.

R: But then she never went on to what are the sun's rays. She could have turned around and gone circle, rays. Remember how you draw the sun with those rays

H: Or the circle with the triangles pointing out. Yes.

R: No. So, later I asked her afterwards to tell me where the sun's rays go? She said they go everywhere. They come to Earth. And I said anywhere else. Well, I said Japan. Yeah you did. (laughing) [table slap] and I'm thinking [laughing] ohh.

H: So, they specifically aim at come to here and Japan.

R: Do you have a thing with Japan? I know you were talking about Denmark. We do have a good relationship; she was in my class in the fall. So, she said Denmark and Japan, where's the connection? Well, Japan is just really far away. You know. Dr. S. is from Farmville. Do those kids in Farmville know where Farmville is? Because I worked in the country in Virginia, south of Blacksburg, is very countrified...

Interview with Science Teacher Educator

H: I'm going to define terminology as it is used in my study.

Trade Books. Trade books refer to books published for and available to the general public; these books may be purchased in book stores and can be found at local libraries. Trade books are available in a wide variety of genres including non-fiction, fiction, and poetry.

Misconception. A science misconception is a thought stemming from incorrect or confusing information. Often misconceptions are formed as a way to answer a question about the world around us. Misconceptions can be advanced through reading literature or in classroom settings; misconceptions can be corrected in a classroom setting and by reading accurate literature.

H: What is your opinion on the recent trend of integrating children's books into the science curriculum?

S: mixed feelings, feels it becomes more about the literature than the science content

H: Have you read any research that supports continued use of this trend? What about research that disputes this trend as successful?

S: does not actively read current research on this trend

H: How do you support integrating content areas in your classroom?

S: good idea, helpful; have had guest speakers including reading people to come in and speak – did not feel it was super successful; strives to integrate social studies and math rather than reading

H: Have you had any experiences with a pre-service elementary education student who inaccurately taught science content?

S: definitely

H: Would you consider his or her mistake to have been based on a content misconception?

S: Yes

H: What are some common areas that you see misconceptions presented?

S: see student misconceptions in writings and lesson plans all the time; don't get to observe practicum hours

H: Common science content areas with misconceptions?

S: light and color, water cycle, rocks (testing with vinegar and acid, misconceptions about calcium carbonate), trees (made of carbon not water or air), plants, animals

H: Have you thought about inaccurate information/misconceptions being presented in children's books?

S: Yes, has occurred when a few students shared books and videos from YouTube; more aware not because of his daughter

H: Have you encountered any experiences with a particular trade book presenting a misconception?

S: Yes, remembers one about the sun and moon – the implication was they were friends and never saw each other because we see them at opposite times

H: Do you have any examples of books that present or confirm science misconceptions?

S: No

H: If you were to use this book in your classroom, what would you do to counteract the misconception presented?

S: teach, use T/F, writings, and drawing to identify prior knowledge; ask students what's wrong with an idea; specifically addressing the misconception by going beyond simply stating the correct answers to discussion reasoning and relationships

H: Would you change the book's position in the 5E Learning Cycle?

S: open to the idea of using it as an elaboration or evaluation piece; strongly encourages students to leave some mystery in the engage component of the 5E cycle