STORY-BASED PEDAGOGICAL AGENTS: A SCAFFOLDING DESIGN APPROACH
FOR THE PROCESS OF HISTORICAL INQUIRY IN A WEB-BASED SELF-LEARNING ENVIRONMENT

A Dissertation in
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by
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ABSTRACT

The purpose of this research was to design and evaluate a web-based self-learning environment for historical inquiry embedded with different types of instructional support featuring story-based pedagogical agents. This research focused on designing a learning environment by integrating story-based instruction and pedagogical agents as a means to deliver the problem context and learning tasks as well as to embed instructional support in an engaging way. Versions of the lesson modules were designed and tested iteratively to determine the impact of pedagogical agents on learners' performances and perceptions regarding the inquiry learning activity.

A design research approach applying a mixed study of quantitative and qualitative research methods was taken. Quantitative and qualitative data in terms of student performances and perceptions of the learning activity were collected through the four rounds of experiments. A multiple-choice comprehension test and essay writing test were assigned to detect different levels of learning performance, and learners’ perceptions were collected through a self-report questionnaire.

The initial study indicated that the story elements and mediation of the pedagogical agent did not have an impact on learning performance, although they succeeded in gaining the interest and enjoyment of learners. The instructional supports were modified to enhance learning performance by providing examples, domain heuristics, and practice opportunities through the interactions with the mentor and peer learner agents.

As a result, while the impact on student enjoyment, interest, and attention held steady, significantly more students delivered situational arguments using multiple perspectives than did those in the control condition. It was also found in the following study that more difficult exercises lacking adequate instructional support may hinder learning performance.
A notable finding of this research was that the use of story-based pedagogical agents impacted students’ ways of interpreting historical sources and making arguments, which was observed in the essay writing task. As previous studies on pedagogical agents have not performed this type of measurement, this study contributed a novel finding. The result also suggested that the story elements have to be incorporated with necessary instructional design considerations in order to foster learning performance while sustaining student interest in the learning activity.
TABLE OF CONTENTS

LIST OF FIGURES ............................................................................................................. vii
LIST OF TABLES ................................................................................................................ viii
ACKNOWLEDGEMENTS ..................................................................................................... x

Chapter 1 Introduction ........................................................................................................ 1
  Problem statement ........................................................................................................ 1
  Difficulties in historical inquiry ............................................................................ 2
  Pedagogical agents to provide scaffolds for inquiry .......................................... 5
  Story-based pedagogical agents: A design approach .......................................... 6
  Research purpose .................................................................................................... 8
  Research questions ................................................................................................. 9
  Significance of the research ................................................................................. 10
  Definition of terms ............................................................................................... 10

Chapter 2 Review of the Literature .................................................................................. 12
  Introduction ............................................................................................................... 12
  Teaching historical thinking through inquiry .................................................... 12
  Challenges in teaching through inquiry ............................................................. 16
  Historians’ fallacies: Experts also make mistakes ............................................. 18
  Educational technologies to support learning in historical inquiry ..................... 19
  Story-based inquiry learning environment ......................................................... 21
  Pedagogical agents as a means to embed scaffolds .......................................... 23
  A debate on the effects of pedagogical agents .................................................. 26
  Seductive details .................................................................................................. 30
  Peer learning agent .............................................................................................. 31
  Conclusion ............................................................................................................... 33

Chapter 3 Methodology ................................................................................................... 36
  Introduction ............................................................................................................... 36
  Design goals and rationale ................................................................................... 36
  Research questions ............................................................................................... 38
  Specifying instructional goals ............................................................................. 38
  Lesson materials ................................................................................................... 40
  Initial design of the lesson modules .................................................................. 42
  Design of the pedagogical agent ......................................................................... 45
  Overview of the research process ........................................................................ 49
  Study 1: Initial prototype design ......................................................................... 51
  Measurement tools ............................................................................................... 55
  General procedure of the studies ....................................................................... 57
  Summary .................................................................................................................. 58
<table>
<thead>
<tr>
<th>Chapter 4 Results and discussion</th>
<th>.................................................................</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>Study 2: Do the story element and mentor-role agent make a difference?</td>
<td>...............................................</td>
<td>60</td>
</tr>
<tr>
<td>Data collection</td>
<td></td>
<td>63</td>
</tr>
<tr>
<td>Data analysis</td>
<td></td>
<td>64</td>
</tr>
<tr>
<td>Discussion</td>
<td></td>
<td>74</td>
</tr>
<tr>
<td>Design iteration 1: the birth of “Joe” the peer learner agent</td>
<td>..................................................</td>
<td>76</td>
</tr>
<tr>
<td>Design modifications</td>
<td></td>
<td>78</td>
</tr>
<tr>
<td>Difference of the conditions</td>
<td></td>
<td>83</td>
</tr>
<tr>
<td>Study 3: Does the addition of peer learning elements make a difference?</td>
<td>..............................................</td>
<td>84</td>
</tr>
<tr>
<td>Introduction</td>
<td></td>
<td>84</td>
</tr>
<tr>
<td>Procedure</td>
<td></td>
<td>85</td>
</tr>
<tr>
<td>Data analysis</td>
<td></td>
<td>86</td>
</tr>
<tr>
<td>How students perceived support from the agents</td>
<td>...........................................................................</td>
<td>90</td>
</tr>
<tr>
<td>Discussion</td>
<td></td>
<td>91</td>
</tr>
<tr>
<td>Design iteration 2: adding more interaction with the agents</td>
<td>..................................................</td>
<td>96</td>
</tr>
<tr>
<td>Study 4: Does the additional interaction cause a more positive influence?</td>
<td>.............................................</td>
<td>98</td>
</tr>
<tr>
<td>Introduction</td>
<td></td>
<td>98</td>
</tr>
<tr>
<td>Procedure</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Data analysis</td>
<td></td>
<td>102</td>
</tr>
</tbody>
</table>

| Chapter 5 Conclusion            | ........................................................................................................ | 111 |
| Summary of findings: what can we see from the results of these studies? | ................................................................. | 111 |
| Limitations                     |                                                                                                 | 114 |
| Implications of the research    |                                                                                                 | 115 |
| Implications for instructional design | ................................................................................... | 118 |

| REFERENCES                       | ........................................................................................................................................ | 121 |
| Appendix A Scripts for the lesson introduction | ........................................................................... | 134 |
| Appendix B Measurement instruments | ........................................................................................................................................ | 136 |
| Question prompts for the learning activity (Study 1) | ........................................................................... | 136 |
| Pre-survey instrument (Study 1-4) | ................................................................................................. | 137 |
| Self-reported questionnaire (Study 2-4) | ................................................................................................. | 138 |
| Comprehension test questions (Study 2-4) | ................................................................................................. | 139 |
| Evaluation exercise for the treatment group (Study 4) | ................................................................................................. | 142 |
| Appendix C Lesson materials       | ........................................................................................................................................ | 143 |
| Appendix D Guidelines for coding  | ........................................................................................................................................ | 152 |
| Appendix E Informed Consent Form for Social Science Research | ........................................................................................................................................ | 154 |
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1</td>
<td>Examples of pedagogical agents.</td>
<td>6</td>
</tr>
<tr>
<td>3-1</td>
<td>The basic structure of the lesson content</td>
<td>42</td>
</tr>
<tr>
<td>3-2</td>
<td>A screenshot from the lesson module (Study 1)</td>
<td>43</td>
</tr>
<tr>
<td>3-3</td>
<td>Sessai explaining the mission (Study 1)</td>
<td>44</td>
</tr>
<tr>
<td>3-4</td>
<td>A screenshot from the lesson module for the control group (Study 1)</td>
<td>45</td>
</tr>
<tr>
<td>3-5</td>
<td>Example of a virtual character in the treatment group (Study 1)</td>
<td>46</td>
</tr>
<tr>
<td>3-6</td>
<td>Example of the document page in the control group (Study 1)</td>
<td>47</td>
</tr>
<tr>
<td>3-7</td>
<td>Modified version of the control group (Study 2)</td>
<td>53</td>
</tr>
<tr>
<td>3-8</td>
<td>Modified version of the treatment group (Study 2)</td>
<td>54</td>
</tr>
<tr>
<td>4-1</td>
<td>A guidance prompt provided by Sessai in the treatment condition of Study 2</td>
<td>61</td>
</tr>
<tr>
<td>4-2</td>
<td>An instructional message prompt provided in the control group for Study 2</td>
<td>62</td>
</tr>
<tr>
<td>4-3</td>
<td>Overview of the procedure of Study 2.</td>
<td>63</td>
</tr>
<tr>
<td>4-4</td>
<td>The peer agent added in Study 3.</td>
<td>78</td>
</tr>
<tr>
<td>4-5</td>
<td>Example of an interaction with the peer agent in Study 3.</td>
<td>81</td>
</tr>
<tr>
<td>4-6</td>
<td>Overview of the procedure of Study 3.</td>
<td>86</td>
</tr>
<tr>
<td>4-7</td>
<td>Overview of the procedure of Study 4.</td>
<td>102</td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table 2-1. Categories of historians’ fallacies by Fischer (1970) ..................................................18
Table 3-1: Guidance script examples of the control and treatment groups (Study 1)..................48
Table 3-2: Script to introduce the instructional materials ............................................................49
Table 3-3: Overview of the experimental studies ........................................................................50
Table 3-4: Questions asked during the learning activity (Study 1)..............................................52
Table 4-1: Dependent variables and measurement tools ...............................................................64
Table 4-2: Descriptive statistics for the learning performance in Study 2 ..................................64
Table 4-3: Essay questions for Study 2 ..........................................................................................65
Table 4-4: Examples of the code categories ..................................................................................68
Table 4-5: Possible points that students could have used in their arguments ..............................68
Table 4-6: Frequency table of code categories in Study 2 ..........................................................69
Table 4-7: Descriptive statistics for perception of the learning activity in Study 2 .................70
Table 4-8: Student comments on the engaging element (Study 2).............................................71
Table 4-9: Example of Sessai’s prompt in the lesson module for Study 2 .................................75
Table 4-10: Example of agent prompts in the lesson module for Study 3 .................................79
Table 4-11: Example of the dialogue between the peer learner and mentor agent .....................80
Table 4-12: Dialogue script for the evaluation exercise .................................................................82
Table 4-13: Dialogue script for the evaluation exercise .................................................................82
Table 4-14: Differences in conditions between Studies 2 and 3 ..............................................83
Table 4-15: Descriptive statistics for the learning performance in Study 3 ...............................87
Table 4-16: Essay questions for Study 3 ......................................................................................87
Table 4-17: Frequency table of code categories in Study 3 .......................................................87
<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-18</td>
<td>Descriptive statistics for perception of the learning activity in Study 3</td>
<td>88</td>
</tr>
<tr>
<td>4-19</td>
<td>Control group essay responses</td>
<td>92</td>
</tr>
<tr>
<td>4-20</td>
<td>Treatment group essay responses</td>
<td>92</td>
</tr>
<tr>
<td>4-21</td>
<td>Example of a one-sided argument</td>
<td>93</td>
</tr>
<tr>
<td>4-22</td>
<td>The dialogue between the peer learner and mentor agents</td>
<td>94</td>
</tr>
<tr>
<td>4-23</td>
<td>Dialogue script for the evaluation exercise</td>
<td>97</td>
</tr>
<tr>
<td>4-24</td>
<td>An example of dialogue script explicitly explaining expert heuristics</td>
<td>98</td>
</tr>
<tr>
<td>4-25</td>
<td>Differences in conditions between Studies 3 and 4</td>
<td>99</td>
</tr>
<tr>
<td>4-26</td>
<td>Essay questions for Study 4</td>
<td>101</td>
</tr>
<tr>
<td>4-27</td>
<td>Descriptive statistics for the learning performance in Study 4</td>
<td>102</td>
</tr>
<tr>
<td>4-28</td>
<td>Frequency table of code categories in Study 4</td>
<td>103</td>
</tr>
<tr>
<td>4-29</td>
<td>Joe’s responses as presented in the evaluation exercise</td>
<td>104</td>
</tr>
<tr>
<td>4-30</td>
<td>Student response to Joe's argument</td>
<td>105</td>
</tr>
<tr>
<td>4-31</td>
<td>Student response to Joe's argument</td>
<td>106</td>
</tr>
<tr>
<td>4-32</td>
<td>Student responses to Joe's argument</td>
<td>106</td>
</tr>
<tr>
<td>4-33</td>
<td>Descriptive statistics for perception of the learning activity in Study 4</td>
<td>108</td>
</tr>
</tbody>
</table>
ACKNOWLEDGEMENTS

I started this research believing it wouldn’t take me nearly as long as it did. It turned out that it was a tremendously tough challenge that required me to unlearn what I have learned in the past and to reconstruct my knowledge and belief as a researcher. Even though it took me much longer than I thought, I believe that it was a necessary process for me to undergo in order to sustain my research career in the long run.

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Chapter 1

Introduction

Problem statement

Historical inquiry refers to an instructional approach that provides learners with an exploratory learning environment in which to evaluate and interpret information in order to solve a historical question regarding a specific historical phenomenon. The inquiry process includes situating historical phenomena in time, describing and explaining historical phenomena, distinguishing the processes of change and continuity, considering the trustworthiness and value of sources, and supporting viewpoints or opinions with relevant arguments (van Drie, van Boxtel, & van der Linden, 2006). Inquiry learning has been gaining attention among researchers of history education as an approach to teaching higher-order thinking skills. U.S. national standards in history now recommend including inquiry learning in social studies classrooms, where students at all grade levels can learn to collect, analyze, and interpret historical information to construct their own conclusions based on obtained information (National Center for History in the Schools, 1996; National Council for the Social Studies, 1994).

This recommendation resulted from a long-standing criticism of traditional history education. Learning history typically requires students to memorize facts and dates written in textbooks. Since history teachers must cover a broad timeline of events and information in a limited amount of time, students do not have much opportunity to conduct historical inquiry within the classroom. Also, most history textbooks only convey the causes and effects of historical phenomenon in order to help teachers cover many topics quickly. Although history education is intended to help students acquire the historical literacy skills necessary to become
sensible and responsible citizens (Kuhn, Weinstock, & Flaton, 1994; NCSS, National Council for the Social Studies), students typically just read and memorize “the facts”, as if there were a single authoritative correct interpretation of history (Hynd, 1999; Van-Hover, Hicks, & Irwin, 2007; Wineburg, 1991).

Recently, researchers have studied the cognitive aspects of historical inquiry. A widely accepted instructional strategy for inquiry learning engages students in collecting, comparing, and interpreting multiple historical sources in order to construct historical accounts. To help students with this process, various approaches have been studied, including teaching expert heuristics (Britt, Rouet, & Perfetti, 1996; Hicks, Doolittle, & Ewing, 2004; Hynd, 1999), constructing collaborative learning environments to facilitate and support students' reasoning processes (Martin et al., 2008; Masterman & Rogers, 2002; van Drie et al., 2006), and teaching strategies to improve students' writing skills (De La Paz, 2005; Spoehr & Spoehr, 1994; Voss & Wiley, 1997). Previous studies show that such instructional strategies are necessary for guiding students during complex learning activities (for the review, see Voss & Wiley, 2006).

**Difficulties in historical inquiry**

There are several challenges in designing an inquiry learning environment. Various problems and issues are reported, including novice learners’ difficulties during the inquiry process as well as the difficulty in guiding learners towards the intended learning process (Land, 2000). For example, ineffective strategies are likely to fail to refine learners’ unproductive strategies (Land & Greene, 2000). If multiple variables are provided to students performing an inquiry task, they often feel compelled to attend to these variables all at once (Kuhn & Dean, 2005). With no specific focus, the students become overwhelmed. Students’ reading habits also pose a challenge. When students read multiple texts, they tend to collect facts and trace common
information across the texts while ignoring the disparate information (Britt et al., 1996; Stahl et al., 1996). Such an approach could be attributed to a lack of domain knowledge and/or a lack of meta-cognitive strategy (Hynd-Shanahan, Holschuh, & Hubbard, 2004; Wineburg, 1998).

From a teaching aspect, there are different issues to consider. History teachers claim that state standards and tests force them to cover an enormous amount of content at a rapid pace, and preclude them from covering individual topics more comprehensively (Van-Hover et al., 2007). This situation prohibits teachers from spending time in the exploration of multiple sources in class, as such activities tend to be more time consuming than the conventional teacher-led lectures. Teachers who feel that such an inquiry approach is overburdening for them or that class time is not adequate to implement inquiry approaches tend to be reluctant to introduce it in their classroom. While national standards in history encourage teachers to use primary sources to help students gain a sense of historical relevance and develop their historical thinking skills, they are not necessarily good at using these sources. Furthermore, not all teachers favor such an approach (Hicks, Doolittle, & Lee, 2004).

Since implementing an inquiry approach usually requires students to interact with teachers and peers, learning environments that foster such an approach are designed for teacher-led classroom use. Teachers must guide and facilitate students in order for them to perform inquiry skills properly. However, as teachers are required to change many aspects of classroom operation and lesson plan structure to accommodate this, not all teachers are in favor of applying the inquiry approach in their classroom.

This research views a self-learning context as an opportunity to design a learning environment that would foster an inquiry approach. The researcher posited that if teacher feedback and interaction with others can be fulfilled by other means, teachers may be encouraged to implement an inquiry approach in their instruction.
Research efforts have been made by research groups to design a computer-based learning environment for historical inquiry (e.g. Hicks, Doolittle, & Ewing, 2004; Martin et al., 2008; O'Neill & Sohbat, 2004; Spoehr & Spoehr, 1994; for a review, see also Wiley & Ash, 2005). These learning environments combine multiple media such as text, pictorials, and videos. This format makes the information more accessible to teachers coordinating inquiry-based lessons as well as to students exploring historical materials.

As noted earlier, there are various difficulties that students face when conducting inquiry. Researchers found that experts can overcome such difficulties by using their domain knowledge. When historians conduct inquiry, they investigate a massive amount of documents. They use various cognitive skills in the process of inquiry, such as discovering clues to solve the problem, understanding the problem context, and maintaining their focus on the problem. Students who do not have such cognitive skills tend to be overwhelmed by multiple data sources and overlook important information in them.

While it is certain that such expert skills cannot be learned in a day, if students can be equipped with particular cognitive skills through one quick introductory lesson, it may be possible that they can at least gain a better understanding from the learning activity. For example, if a novice golfer practices for the first time at a driving range, it may take him awhile to understand what makes a good shot when he practices alone. Even if there are many good players practicing around him, it is still difficult for him to learn by observation since certain techniques are not overtly obvious. However, if an expert golfer passes by and teaches him quick tips such as how to grip the club and where to look when hitting the ball, he should be able to digest these expert “clues” and perform much better.

While there are various ways to approach historical inquiry, such expert tips in the form of expert heuristics are undoubtedly a solid way to do so. Several researchers developed learning environments that teach the use of such heuristics when investigating historical documents (e.g.
Britt et al., 2000; Martin et al., 2008; Saye & Brush, 2002; van Drie et al., 2006). They teach students cognitive skills such as where to focus, how to find clues, and what to compare among multiple sources. Similarly, this research focused on the design of a learning environment that would support students in learning such skills.

**Pedagogical agents to provide scaffolds for inquiry**

Teachers typically provide instructional supports in classroom settings. In a standalone learning environment, these supports must be implemented in other ways. In computer-based instruction, pedagogical agents are applied as a means to substitute human support by simulating teacher facilitation and instant feedback, and generally restoring the social aspect of learning in a self-learning context.

Pedagogical agents are visualized virtual characters with a certain personality and are designed to support learners in a learning environment. For example, most users of Microsoft Office products have encountered the animated paper clip that provides help for writing tasks (see Figure 1-1 below). Pedagogical agents have been studied in various domains including engineering (Baylor, Rosenberg-Kima, & Plant, 2006), botanical environments (Moreno et al., 2001), and mathematics (Atkinson, 2002) (see Chapter 2 for more examples). The embodiment of a lifelike character is considered a means to enhance the social aspect of learning in human-computer interactions (Atkinson, 2002; Moreno, 2005).
Previous research indicates that pedagogical agents may have a positive influence on enhancing learners’ interest and attention in their learning activity (Kim, Baylor, & Shen, 2007; Veletsianos, 2007). However, it has also been argued that applying a pedagogical agent itself may not have a positive or negative impact and that instructional methods implemented in the design actually have a stronger influence on learning (Choi & Clark, 2006). The argument seemed to be inconclusive due to insufficient studies on this theme (further discussion of pedagogical agents is continued in Chapter 2). Nonetheless, from a designer’s perspective, pedagogical agents can be considered as a means to embed personalized instructional support in a self-learning environment.

**Story-based pedagogical agents: A design approach**

Although very few studies have been conducted to justify this notion, narrative may be a design element that can make the use of pedagogical agents more valuable. There are several instructional design approaches that use story to facilitate learning. These feature story elements that help provide context for problem-solving. Such elements include anchored instruction (Cognition and Technology Group at Vanderbilt, 1990) and Goal-based Scenarios (Schank et al.,...
Researchers of multimedia learning have also studied the effects of applying narrative elements to make a learning activity more productive (Luckin et al., 2001; Plowman et al., 1999). In addition, there are many commercial training simulation products that deliver problem contexts in narrative form (Aldrich, 2005).

Story-based computer-based instruction utilizes visualized characters to deliver instruction in various forms. Characters include that of story-teller, protagonist of the scenario, and virtual mentor. One well-known example is Jasper who appeared in *The Adventures of Jasper Woodbury* series (Cognition and Technology Group at Vanderbilt, 1992). While such characters can be considered pedagogical agents in a broader sense, they may not have been particularly designated to support learning.

Stories are used to describe the problem context and to deliver instruction. Characters in a story help to engage learners in the learning activity. As activities in historical inquiry require learners to construct narratives to explain how they interpret the narratives, story-based instruction that provides learners with the problem context and learning tasks in a narrative format may be a viable approach to familiarize learners with the narrative-oriented nature of historical inquiry.

On the other hand, most pedagogical agent studies focus on the effectiveness of presenting a pedagogical agent without considering its relevance for the context. That is, the agent appears as a teacher or someone who has nothing to do with the issues presented in the learning activity (Veletsianos, 2007). Therefore, the researcher posited that integrating story-based instruction and pedagogical agents may be a possible design approach to engage students in a historical inquiry task as well as extend inquiry-based instruction to self-learning contexts.

This research concerns the impact of pedagogical agents integrated with the story element, which is named story-based pedagogical agents in this dissertation. The story-based pedagogical agent is a design approach for an inquiry learning environment that embeds pedagogical agents in
story-based instruction. This approach is intended to fill in the gap between current studies on pedagogical agents and older studies on story-based instructional design. While story elements provide learners with background context and assistance to solve a problem, pedagogical agents provide scaffolding techniques to engage students in deeper inquiry learning. Although such an agent approach has already been practiced in story-based instruction, this research focused on the agent as a means to deliver particular instructional methods to teach historical inquiry.

**Research purpose**

The purpose of this research was to design and evaluate a web-based self-learning environment for historical inquiry embedded with different types of instructional support with story-based pedagogical agents. Versions of the lesson modules with and without pedagogical agents were designed and tested iteratively to determine the impact of pedagogical agents on learners' performances and perceptions regarding the inquiry learning activity. Instead of arguing whether a pedagogical agent is beneficial for learning in general, the researcher attempted to articulate how pedagogical agents could be applied to provide instructional support to learners during the historical inquiry activity, and what instructional method should be embedded to make the approach work.

While various principles and guidelines to design an inquiry learning environment have been suggested by researchers (e.g. Hannafin, Land, & Oliver, 1999; Jonassen, 1999), a critical issue is how we can actually implement them in a specific learning context to address specific instructional needs (in this case, supporting the process of historical inquiry in a self-learning context). Therefore, the goal of this research is to clarify how story-based pedagogical agents work for the design of a self-learning environment for historical inquiry in order to inspire discussion of how such a design approach could be further developed.
**Research questions**

This research aims to answer the following questions:

(a) Does the use of different scaffolding strategies embedded in story-based pedagogical agents have an impact on learners’ content comprehension in a web-based historical inquiry learning environment?

(b) Does the use of different scaffolding strategies embedded in story-based pedagogical agents influence the learners’ historical reasoning as measured in an essay writing task?

(c) Does the use of different scaffolding strategies embedded in story-based pedagogical agents have an impact on learners’ perceptions of the learning activity in terms of enjoyment, interest, attention, difficulty, and efficacy?

These questions served as guides during the design iterations. Comprehension and essay writing tests were assigned to detect different levels of learning performance, and learners’ perceptions were collected through the self-report questionnaire.

This research took a design research approach (Brown, 1992; Design-Based Research Collective, 2003; Reigeluth & Frick, 1999), applying a mixed study of quantitative and qualitative research methods. Quantitative and qualitative data in terms of student performances and perceptions of the learning activity were collected through the rounds of experiment with iterated design of the inquiry learning environment. The lesson module was iterated and tested by way of four formative experiments during the research process.

Chapter 2 describes the theoretical background of the design. The overall research process is illustrated in Chapter 3. The procedures and results of the experiments conducted in this research are reported in Chapter 4. Finally, the findings and conclusions of the research are discussed in Chapter 5.
Significance of the research

This research suggested a design approach that embeds scaffolds for learners in a web-based inquiry learning environment by applying story-based instruction and pedagogical agents. This works as a subsidiary design approach for the design of computer-based inquiry learning environments, especially for self-learning settings. While there are various ways to attain the same design goal, the key concept of this approach is delivering instructional supports with pedagogical agents in story-based learning environments to enrich the learning context and to guide learners during an engaging inquiry learning task.

It is expected that the research provides fundamental information for instructional designers and educators who are making efforts to create such learning environments. Findings of the research might be informative for researchers and designers working on game-like learning environments, Multi-User Virtual Environments, and other story-based learning environments, since these approaches address non-user character elements found in stories with embedded instructional support.

Definition of terms

*Historical inquiry* refers to an instructional approach that provides learners with an exploratory learning environment in which to evaluate and interpret information in order to solve a historical question regarding a specific historical phenomenon. The inquiry process includes situating historical phenomena in time, describing and explaining historical phenomena, distinguishing the processes of change and continuity, considering the trustworthiness and value of sources, and supporting viewpoints or opinions with relevant arguments (van Drie et al., 2006).
**Self-learning environment** refers to an individual learning environment in which learning goals and content are embedded. Learning tasks are contextualized in the represented situation.

"Story-based" in this research points to the use of a narrative to engage learners in the learning activity. “Narrative” is a confusing term in instructional design for history education because it includes various layers of meaning. In the domain of history, all materials are related to the narrative. Accounts that explain historical phenomena are written in the form of a historical narrative, and evidence to make an argument is usually narrative-based. The narrative is also an element used in designing a learning environment in the domain of educational technology. Thus, the term "story-based" highlights the slight differentiation from its generic use that "narrative" takes in this research.

**Pedagogical agents** can be defined as visualized virtual characters with a certain life-like personality, which may or may not be animated, and are designed to support learners in a learning environment. They were used in this research as a means to personalize the interaction between the learner and the computer. The main motive of using pedagogical agents was to provide a learning context as well as instructional supports. Characters in the story worked as pedagogical agents to purposefully embed scaffolds that facilitated the learning activity.
Chapter 2

Review of the Literature

Introduction

The main purpose of this chapter is to illustrate (1) the context of common learning problems faced by students, and (2) the theoretical background for the design of the learning environment intended to address these problems.

To clarify the scope of the learning problems, the expertise of the historian as well as the issues of novice learners while engaging in inquiry-based learning are discussed. Then, relevant studies on story-based instruction and pedagogical agents are examined prior to setting up a design framework for this research.

Teaching historical thinking through inquiry

Researchers define history in various ways. For example, Leinhardt, Stainton, and Virji (1994) state that “history is a process of constructing, reconstructing, and interpreting past events, ideas, and institutions from surviving or inferential evidence to understand and make meaningful who and what we are today” (p. 88). In this sense, historians are experts who conduct a process of inquiry and construct historical knowledge. Voss and Wiley (2006) note that the general goal of the historian is “to study a particular topic and provide a coherent, interpretive, and persuasive account stating a position that usually but not necessarily is a narrative. The contents of the narrative are usually concerned with the changes that took place in the topic being studied and what produced them” (p. 571). In reviewing the research on the expertise of historians, Voss and Wiley also found that historians do the following when creating historical knowledge:
(1) Obtaining information: historians obtain information from a variety of textual and non-textual resources, such as personal papers, records, diaries, books, paintings, and photographs. They need to examine and evaluate their reliability, validity, authenticity, and usefulness. These actions organize the information for the following step.

(2) Narrative construction and analysis: historians analyze sources by developing mental representations of events and activities discussed or described in the sources. They then provide a reasonable account of particular historical events and actions. An historical narrative is constructed to support evidence and to make causal arguments. The narrative works as a cognitive tool to interpret the events they have investigated. Coherence, chronology, completeness, contextualization, and causation are the components that good narratives have in common.

(3) Reasoning and problem solving: Historians first identify a problem and then pose interesting yet researchable questions. Reasoning includes an inferential process using domain knowledge to relate the information to the existing knowledge. Problem solving in history does not always lead to specific solutions, as it handles ill-structured problems. The problem solving process in history usually deals with analyzing the problem context and explaining how the problem should be solved. Describing problem representation is the process of finding out the constraints of the problem. The solution goes toward the satisfaction of the constraints. For example, when historians discuss the failure of the Soviet Union, they discuss not only the problems of the Soviet Union, but also the relevant situations of other countries. By doing so, they gain a more objective perspective of the cause of the problem (e.g. identifying that the lack of modernization in the Soviet Union caused poor crop productivity by comparing this situation with that of England). While novices tend to only look at specific problems within the Soviet Union, historians detect the constraints of the problem by looking at the broader context.
Some researchers have made efforts to clarify the methods used by historians. For example, regarding the process of obtaining information, Wineburg (1991) observed the methods by which expert historians and high school students processed information found in multiple historical documents in order to see how both groups collect and make sense of information. He found that historians interpret the documents as arguments instead of concrete facts, whereas high school students tend to consider the texts otherwise. While historians try to find the differences or contradictions among the texts, high school students tend to focus on the information that all the texts have in common, while ignoring the differences.

Wineburg also found that historians use reading heuristics, which includes sourcing, contextualization, and corroboration, to process information in the documents, while high school students do not. Sourcing is the act of examining the source of the document to figure out its basic attributes before reading the body of the text. Historians use sourcing to gain information such as who the author of the document is, when it was written, and what type of document it is. Such information provides readers with clues to infer various issues, including the author’s intentions of writing the document and its trustworthiness. While historians use such information firsthand to construct a mental map of the historical phenomenon, students tend to overlook it and fail to find clues to understand the phenomenon.

Contextualization is recognizing that the information contained in a historical document belongs to a particular timeframe and context in order to understand historical phenomena. For example, when a document states “At the break of dawn on the first day of March, the battle began,” historians look at the time and location presented in the document and make a connection with other data in that timeframe. They then infer the context of the situation, which may be relevant to understanding the event. When the time and place of the event are detected, clues to consider the event are invoked in the historians’ minds based on their focus of the investigation. If they are interested in the tactical issues of the battle, they may consider the weather of the day...
and the soldiers’ equipment. If they are interested in the political situation of the battle, they may try to discover political influences underlying the battle.

Corroboration is the process of comparing documents with one another and contrasting viewpoints in multiple texts to see events from different perspectives. In the example above, if historians find a picture showing the battle taking place on a sunny day, but had previously learned from a more credible source that the day was rainy, then they would recognize a discrepancy between the two pieces of evidence. Most likely, they will assume the picture is less credible regarding the weather. Wineburg and other researchers in history education posited that although these heuristics help historians to work on inquiry efficiently, students are likely to face more difficulties and become easily overwhelmed by the massive information in the documents.

Recent studies stress the use of multiple historical sources that allow students to engage in historical inquiry (e.g. Britt et al., 2000; Grim, Pace, & Shopkow, 2004; Hynd-Shanahan et al., 2004; Hynd, 1999; Martin et al., 2008; Tally & Goldenberg, 2005). This approach uses various historical materials and provides students with an opportunity to solve historical problems. Instead of following a single textbook, this approach lets students investigate multiple texts so that they can practice critical reading and thinking skills within the domain of history. For example, Hynd (1999) suggests the following principles be applied to teach historical thinking:

1. Provide students with time to learn background knowledge.
2. Discuss with students the methods that historians use and provide them with opportunities to engage in a historian’s activities.
3. Teach students to use sourcing, contextualization, and corroboration when reading historical and other documents.
4. Students should be taught that texts are to be read critically.
5. Students should be taught how to write about history.
6. Help students to recognize historical thinking.
Although these principles can be helpful, the challenge for instructional designers is how to successfully implement these principles into the design of a learning environment for a specific learning context.

**Challenges in teaching through inquiry**

When applying this approach, it is also important to keep in mind that learners have to be guided appropriately and offered the means to perform the inquiry. Otherwise, learners may only attend to the features made explicit by the teacher. In this case, allowing students to investigate the materials by themselves will not work as expected. If domain knowledge is useful for students to perform historical inquiry, it is necessary to help students understand how to detect significant features in the materials they investigate and how to compare these against other features in order to interpret and yield conclusions based on the investigations (Smith & Reiser, 2005).

This issue becomes more problematic when teaching novice learners. History teachers need to teach learners basic facts as well as help them understand historical contexts to ensure the success of the inquiry activity. As teachers are under pressure to cover a vast amount of content in a very limited time, teaching higher-order thinking skills through inquiry may be time consuming work for them. Also, some teachers tend to assume that the majority of students are neither willing nor able to engage in historical inquiry activities (VanSledright, 2002). This assumption may make them reluctant to adopt inquiry learning in their classroom.

Although it is assumed that the majority of learners have the literacy skills needed to read and understand primary sources, there may be several learners who need additional instructional support. Greene (1994) points out that although a learning activity using multiple primary sources is consistent with a constructivist learning strategy and may be an effective approach, it may also be overwhelming for learners who do not have the background knowledge and/or basic literacy
skills to conduct those activities effectively. Van Drie and Van Boxtel (2008) summarized students’ problems when reading and interpreting multiple sources:

1. Students tend to have difficulties taking alternative views into account and only support arguments in favor of their point of view.

2. Students tend to have difficulty in using sources extensively and hardly examine their trustworthiness.

3. To contextualize the collected information, broader and detailed factual knowledge may be helpful, but students usually possess a very limited extent.

4. Students tend to fall into presentism, judging historical phenomenon from their own standards of modern society.

5. Students often find it difficult to explain complex causes and relationships within the historical phenomena.

As noted earlier, historians possess a broad range of domain knowledge and knowledge of heuristics. They are better able to distinguish relevant from irrelevant information, as well as figure out the relationships between multiple sources. Historians are also aware that the context affects the interpretation of the sources. Novice students, on the other hand, usually do not have the domain knowledge needed to understand the relevance of the information or to recognize clues that connect multiple sources. Instead, they tend to take historical sources as matters of fact (Wineburg, 1991). Hynd (1999) observed that while some students could read multiple texts critically, most could not. She argued that students may be influenced by their years of previous instruction in school where history was taught as one clear narrative through a series of facts, rather than presented as full of factual conflicts.
Historians’ fallacies: Experts also make mistakes

Even trained historians are subject to mistakes in their professional work. Fischer’s taxonomical argument on historians’ fallacies (Fischer, 1970) is helpful to understand the nature of domain-specific fallacies in history. He illustrated various fallacies in the process of investigation, explanation, and argument committed by professional historians. For example, Fischer posited that historians are susceptible to a common form of empirical error in factual verification when they attempt “to establish the existence of a quality in A by contrast with a quality in B - and B is misrepresented or misunderstood (p. 56)”. He called such an error “the fallacy of the appositive proof”. Fischer detected more than 100 types of such fallacies through his extensive review of the literature and assembled them into 11 fallacy categories in the processes of inquiry, explanation, and argument (see Table 2-1).

Table 2-1. Categories of historians’ fallacies by Fischer (1970)

<table>
<thead>
<tr>
<th>Process</th>
<th>Category</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inquiry</td>
<td>Fallacies of Question-Framing</td>
<td>The Baconian fallacy&lt;br&gt;The fallacy of many questions&lt;br&gt;The fallacy of false dichotomous questions</td>
</tr>
<tr>
<td></td>
<td>Fallacies of Factual Verification</td>
<td>The fallacy of the pseudo proof&lt;br&gt;The fallacy of the irrelevant proof&lt;br&gt;The fallacy of the negative proof</td>
</tr>
<tr>
<td></td>
<td>Fallacies of Factual Significance</td>
<td>The holist fallacy&lt;br&gt;The fallacy of essences&lt;br&gt;The prodigious fallacy</td>
</tr>
<tr>
<td>Explanation</td>
<td>Fallacies of generalization</td>
<td>Fallacies of statistical sampling&lt;br&gt;The fallacy of the lonely fact&lt;br&gt;The fallacy of statistical special pleading</td>
</tr>
<tr>
<td></td>
<td>Fallacies of narration</td>
<td>The fallacy of anachronism&lt;br&gt;The fallacy of presentism&lt;br&gt;The antiquarian fallacy</td>
</tr>
<tr>
<td></td>
<td>Fallacies of causation</td>
<td>The fallacy of post hoc, propter hoc&lt;br&gt;The reductive fallacy&lt;br&gt;The fallacy of indiscriminate pluralism</td>
</tr>
<tr>
<td></td>
<td>Fallacies of motivation</td>
<td>The pathetic fallacy&lt;br&gt;The apathetic fallacy&lt;br&gt;The idealist fallacy</td>
</tr>
<tr>
<td></td>
<td>Fallacies of composition</td>
<td>The fallacy of composition&lt;br&gt;The fallacy of division</td>
</tr>
</tbody>
</table>
Fischer’s work illustrates that there are various technical difficulties in historical inquiry that challenge students as well as trained historians. Although many fallacies are rather technical or complicated and seem irrelevant for students, there are some general fallacies that students are more prone to commit. For example, the fallacy of the one-dimensional man is defined as an explanation fallacy which “selects one aspect of the human condition and makes it into the measure of humanity itself” (p. 200). There is also the fallacy of overwhelming fact, which involves generalizing an explanation while ignoring important information. These fallacies reflect novices’ typical behavior in inquiry, as novices tend to have difficulty in considering alternative viewpoints when interpreting historical sources (Wineburg, 1991; Van Drie and Van Boxtel, 2008). While the main focus of this research is not to examine the relationship of expert-novice difference in the use of such fallacies (keeping in mind, they are not entirely applicable for novices), Fischer’s compilation of historians’ fallacies does offer a taxonomy that demonstrates the typical characteristics of errors in historical inquiry.

**Educational technologies to support learning in historical inquiry**

To address the student difficulties described above, researchers have been working to design technology-based learning environments that promote critical thinking through historical inquiry (e.g. Hicks, Doolittle, & Ewing, 2004; Martin et al., 2008; O'Neill & Sohbat, 2004; Saye
& Brush, 2002; Spoehr & Spoehr, 1994; for a review, see also Wiley & Ash, 2005). Various multimedia software applications, hypermedia archive viewers, and collaborative learning systems have been constructed by researchers. One such approach involves using hypermedia corpus as a learning platform (Spoehr & Spoehr, 1994), which allows students to explore multiple sources in various types of media, such as texts, pictorials, and videos. Through engaging in tasks to create concept maps and to solve problems, students acquire the skills to think critically.

O'Neill & Sohbat (2004) studied how a web-based collaborative learning environment serves as a tool to support students learning about the history of the Canadian Pacific Railway construction. Their design featured the collaborative aspect of using educational technology. It allowed students to communicate with expert mentors via an online discussion board. Questions and answers were exchanged between students and mentors regarding how and where to conduct investigations. The study showed the usefulness of a multimedia-based inquiry project to influence students in terms of understanding history.

Hicks et al (2004) developed a lesson plan with a narrative-based simulation in which students play the role of detective and find out what happened in a historical context. The lesson is designed to support strategies for historical inquiry such as exploring historical questions, comprehending and working with ideas from various sources, recognizing and attempting to reconcile conflicting accounts, and constructing explanations and narratives that reveal an understanding of historical context and chronology. Other efforts have been made by research groups to design a web-based learning environment for historical inquiry (e.g. Martin et al., 2008).

Most of these efforts have been made to create a technology-based learning environment to support teacher-led classroom activities. Very few of them were designed to use outside the classroom without teacher guidance or collaboration with other students. Available software applications to be used outside the classroom are mostly drill-and-practice (e.g. test preparation software often containing mini-games to help users memorize important dates and historical
events with puzzles and quizzes) or “edutainment” types of software applications such as “The Oregon Trail series” that mainly assist with factual knowledge acquisition or excessively focus on entertaining students. We rarely see the kind of technology-based self-learning environment that fully supports a deeper learning process and can be employed outside the classroom.

**Story-based inquiry learning environment**

When designing a self-learning environment, a story can act as a means to deliver factual and contextual information. Long before digital technologies became available, stories or narratives were widely used as a form of information delivery in every part of daily life. It is considered a way to organize experience and memory, which helps to recall facts, share contexts, and engage learners (Bruner, 1991; Jonassen & Hernandez-Serrano, 2002). In the domain of history, historical narratives serve as fundamental requirements in history education. Constructing a historical narrative is viewed as one of the most important skills for historians to have (Voss & Wiley, 2006).

The story also takes an important role in history-related entertainment forms such as historical fiction novels, movies, comics, and animation. The use of educational comics as supplemental texts to teach history is well-accepted, especially in Japan, where almost every school and public library purchases such comics for students (Yamauchi, 1980; Shimizu, 1991). Parents are willing to let their children watch educational animation based on its historical content. Clearly, the story has a practical application in introducing a taste of history to learners, especially novice-level learners who need to be motivated and guided to go deeper into the world of history.

In this research, "story-based" means to apply a fictional or non-fictional story as a means to create an engaging inquiry learning context. In the design approaches of constructivist learning
environments, the context of “authentic problem” is usually delivered as a case written in narrative form. A case includes information such as background context, the role of the learners, and the mission of the activity.

Several design approaches of a constructivist learning environment have used a story to deliver the problem context and to realize externally induced enabling contexts (Hannafin et al., 1999). For example, Goal-based Scenarios (GBS) make use of a story to provide learners with a learning context and problems to solve in the learning environment. GBS addresses the issue of how to align the narrative with instruction in a story-based learning environment by providing the following design criteria (Schank et al., 1993):

1. Thematic coherence. The learning goal and the mission in the activity have to be thematically consistent
2. Realism/richness. The scenario for the activity has to be realistic and rich enough to provide various learning opportunities
3. Control/empowerment. The mission has to make learners feel responsible to complete the task so that they will appreciate the skills they use
4. Challenge consistency. The level of difficulty has to be adjusted to the abilities of the learners
5. Responsiveness. Necessary information to complete the task has to be provided in a timely and useful manner
6. Pedagogical goal support. The scenario for the activity has to support the acquisition of the target skills
7. Pedagogical goal resources. The method used for the delivery of the resources necessary to practice the tasks has to promote the acquisition of the skills

An important indication of this guideline is that the narrative needs to be as relevant as possible to reduce unnecessary confusion or inefficient effort by learners. It is also necessary to
have a clear focus of the target skills in order for the learning environment to be effective. Learning tasks situated in the context are delivered through characters in the scenario. The characters can be used as a means to integrate the learning tasks within the context, and to design a rich learning environment to support students in conducting historical thinking effectively. Such characters are called avatars or pedagogical agents, and their benefits and applicability have been studied by researchers.

**Pedagogical agents as a means to embed scaffolds**

Pedagogical agents have been gaining attention since the early 90s and have recently emerged as a major research theme in the realm of computer-based learning (for a review, see Clarebout et al., 2002; Dehn & van Mulken, 2000; Johnson, Rickel, & Lester, 2000; Moreno, 2005). Pedagogical agents are visualized virtual characters with a life-like personality, which may or may not be animated, and are designed to support learners in a learning environment. Researchers refer to pedagogical agents as “animated” pedagogical agents (e.g. Johnson et al., 2000) and often focus on perfecting the audio and visual elements of such agents for use in computer-based learning environments.

The role of an agent can be that of teacher, mentor, coach, tutor, or peer with any type of appearance. Human, animal, robot, monster, office stationery, or theoretically any kind of visual symbol with life-like reactions can be used as an agent (as noted in the previous chapter, one well-known example is Microsoft Office’s “help” assistant, which takes the form of a paper clip). Pedagogical agents have been developed to teach within various knowledge domains. For example, Adele (Johnson et al., 2000) was developed for medicine and dentistry education, Herman the Bug (Moreno et al., 2001) for teaching botany to middle school students, Whizlow (Lester et al., 1999) for computer programming, and Gandalf for the solar system (Cassell &
Thorisson, 1999). Multipurpose instructional agents such as PPP Persona (Andre et al., 2000) and Auto Tutor (Graesser et al., 2005) have also been developed. Furthermore, recent doctoral dissertation research on pedagogical agents has studied their applicability for language training (Choi, 2005; Perez Galluccio, 2008; Xu, 2009), computer literacy (Behrend, 2009; Ebbers, 2007; Harrison, 2009; Kim, 2004; Morabito, 2005; Park, 2005), and various academic domains from elementary to college levels (e.g. Adcock, 2004; Clarebout, 2005; Frechette, 2008; Kirk, 2008; Moreno, 1999; Morey, 2008; Sandra Yu Okita, 2008; Sibuma, 2007; Veletsianos, 2008; Wang, 2008; Zielke, 2007). These previous studies indicate that pedagogical agents are considered applicable to virtually all knowledge domains for any level of learner.

In these studies, pedagogical agents are used for various purposes. First, they are used to make the learner’s interaction with the computer and learner more entertaining and enjoyable. It is expected that by using virtual characters, learners can become emotionally involved in the learning activity. Second, pedagogical agents are also used to gain the attention of learners. The characters interact with the learners by gesturing and indicating the important part of the displayed information. They react to the learners’ action and provide information to help learners based on their progress. Third, they are used to bring a social context to a computer-based learning environment. Agents are intended to have relatable characteristics and deliver personalized messages to learners. They are also capable of adapting and responding to the learners’ actions in such a way as to have a conversation with the learners. Such interactions make learners feel as if they are learning with others, even though they are in a solitary setting.

Researchers are interested in these aspects of pedagogical agents and have studied them in various ways. Previous studies focus on the effectiveness of pedagogical agents by comparing conditions with and without a pedagogical agent and examining the effects of the agent’s role, appearance, reaction timing, adaptation, learning control, delivery modality, and other propositions (Clarebout et al., 2002). Evaluations of the learners’ subjective experience of the
activity were gathered by way of a questionnaire, and learning performances were assessed through posttests. Based on the study results, Moreno (2005) stated that the potential effects of pedagogical agents fall into the following nine categories: (1) the persona effect, which holds that the presence of a pedagogical agent may work positively; (2) the image effect, which holds that the use of a visual image of a pedagogical agent may work positively; (3) the modality effect, which holds that the combination of image, voice, and text to present a pedagogical agent may have different effects; (4) the animation effect, which holds that the use of animation to present a pedagogical agent may work positively; (5) the redundancy effect, which holds that using voice and on-screen text to present a pedagogical agent may not work positively; (6) the interactivity effect, which holds that generating answers before listening to a pedagogical agent's explanation improves performance; (7) the personalization effect, which holds that personalized messages to present a pedagogical agent may have the positive effect of promoting deeper learning; (8) the guidance effect, which holds that explanatory feedback to guide students in the process of discovery during the learning activity may have a positive effect; and (9) the self-explanation effect, which holds that prompting questions may have a positive effect.

Based on these effects, advocates of pedagogical agents attribute the potential motivational and cognitive benefits to their external design elements (e.g., appearance, non-verbal expressions). However, previous studies indicate mixed results on these potential effects of pedagogical agents. For example, although image and animation effects are supported by studies that compared the use of an image to the use of no image, other studies that took a similar approach did not support them (van Mulken et al, 1998). While many such studies support pedagogical agents' engagingness and entertainingness, it is not yet conclusive whether pedagogical agents have positive effects on promoting knowledge acquisition or facilitating deeper learning.
A debate on the effects of pedagogical agents

Advocates and opponents of pedagogical agents often debate their effectiveness (Clark & Choi, 2005, 2007; Moreno, 2005; Veletsianos, 2007). While advocates insist that pedagogical agents play a supportive role in the learning process (Moreno, 2005; Veletsianos, 2007), opponents (Clark & Choi, 2007) claim that they are a potential source of distraction and interference for learning and are not cost-effective, as a cheaper approach could bring the same result (Choi & Clark, 2006). Choi and Clark’s claim was based on their experimental study (Choi & Clark, 2006) comparing different conditions within the same learning environment to teach relative clauses. One condition made use of a pointing arrow with narration, while the other made use of a pedagogical agent with the same function. The results indicated no significant difference in learning outcomes between the two conditions.

Veletsianos (2007) commented against their claim by questioning their lack of consideration regarding contexts and aesthetics. In Choi and Clark’s study, they created a pedagogical agent “Genie” using the Microsoft Agent technology, which pops up to assist learners on the lesson slides. Veletsianos pointed out that (1) Genie seems irrelevant to the context of learning English and does not have a likable persona. He also reiterated that an unlikeable agent may not have a positive influence. (2) As Genie is in the same tribe of the notoriously unpopular Microsoft Office assistant “Clippy”, learners may stereotype Genie as an annoying agent and be less engaged. Clark and Choi’s (2007) rebuttal claimed that while the aesthetics of an agent may be important, it is not clear to what degree these attributes need to be refined in order to have a positive impact. Advocates have not shown empirical evidence to claim as such.

Although the debate seems to be inconclusive, it has raised several issues and clarified the shortcomings of the arguments of both sides. First, advocates of pedagogical agents seem to
overemphasize the importance of "animated" features or the "life-likeness" of a pedagogical agent, as found in its appearance or non-verbal reactions. In spite of the studies indicating such external features may not necessarily produce strong effects on students' learning outcomes or on their perspectives of the learning experience (Dehn & van Mulken, 2000; Moreno, 2005), many previous studies have continuously examined the effects of different appearances, communication styles, and reaction types. Most of the previous studies are unclear as to why specific instructional approaches are applied and how they worked. Very few studies focus on the details of instructional strategy delivered through agents. Therefore, instead of studying the slight difference of a pedagogical agent’s appearance or characteristics, it seems more beneficial to shift the research focus to instructional strategies in order to improve the application of pedagogical agents. Otherwise, we may never be sure how to embed appropriate instructional methods into a pedagogical agent even if a very sophisticated pedagogical agent becomes available.

Second, there seems to be confusion regarding the attribution of the effects. Some of the effects of pedagogical agents mentioned above may not necessarily be attributed to the use of pedagogical agents. For example, the delivery modality effect, using a mix of audio, text, and visual representations to make a difference in learner perceptions, exists regardless of the use of pedagogical agents in the instruction (Choi & Clark, 2006). Previous non-pedagogical agent studies also show that effects caused by different feedback strategies or personalized messages work without the existence of a virtual character. Although some researchers claim that these effects are part of the benefit of applying pedagogical agents, these effects should not automatically be attributed to the use of pedagogical agents. As noted by Moreno (2005), they should be considered as design elements to improve the quality of the agent.

Third, the notion of “media equation” (Reeves & Nass, 1996) mentioned by advocates of the persona effect has to be considered further. The media equation refers to the notion that users of media treat them as if they were a human or living entity with a personality. According to this
notion, characteristics of gender (Kim & Baylor, 2006) and ethnicity (Moreno & Flowerday, 2006) found in pedagogical agents are thought to have the same psychological effects on the learner as a real person with those same characteristics would have. If so, it is reasonable to assume that a very realistic and attractive pedagogical agent with poor teaching skills would not teach better than one with great teaching skills, as would be true of a human teacher in the same situation. In this sense, it is not so constructive to argue whether a pedagogical agent is a potential source of distraction and interference for learning or not, because we already know the answer. A pedagogical agent can always be a source of distraction and interference if the agent interacts with learners using an annoying communication style or utilizes a bad teaching strategy, which is also true of human teachers.

Fourth, we should keep in mind the advancement of digital technologies when considering the research focus of pedagogical agent studies. Since digital technologies advance very rapidly, technologies to realize very life-like pedagogical agents such as engines for 3D-rendering, text-to-speech, and voice recognition are more and more accessible for designers at a cheaper cost (just compare current digital game technologies with those from 10 years ago). Furthermore, the costs of creating realistic animated pedagogical agents may not be much of an issue in the near future. Regardless of how much we understand the appropriate “animatedness” of agents, the standard of technology will advance rapidly as it enables us to create more sophisticated and life-like agents using the same amount of effort and spending the same amount on production costs. Thus, preoccupation with perfecting the visual quality of the agents to keep up with the current technology standard is fruitless if that work will become outdated in a matter of months.

Fifth, although the researcher agrees with Choi and Clark’s position that how we embed effective instructional strategy in the learning environment should be more important than the persona effect or the existence of a pedagogical agent (Choi & Clark, 2006), their claim seems to
overgeneralize the conclusion of their study. As noted above, previous studies on the effects of applying a pedagogical agent, including the persona effect as claimed by the advocates, showed mixed results and could not determine the degree to which they were important (Moreno, 2004). A possible interpretation of the previous studies is that these effects are not main effects on learning alone, but rather subsidiary effects that moderately influence learners when implemented appropriately in combination with other design elements. Although a pedagogical agent may work as a tool to enhance guided social interaction in a computer-based individual learning environment, it is still necessary to apply an effective instructional strategy to the agent that best suits the learner’s need.

In this sense, Choi and Clark’s argument makes sense. However, they miss the point that a pedagogical agent is a designed artifact or system, not a fixed substance. A designed pedagogical agent consists of a set of design elements or sub-system components. The design elements work systemically and affect learner perception and interaction. For example, the persona effect would not occur due to the existence of a single design element but would rather emerge from a combination of applied elements such as animated images, voices, and feedback strategies. While it is important to understand the characteristics or functions of each element, it is difficult to understand how the set of elements influences the learner’s performance or perception of the learning experience by merely deducting and assessing the effect of each element independently. This is because the sum of each element’s effect would not be the same as the entire agent’s persona. A one-shot experimental study with a very short-term intervention alone would not yield conclusive evidence. This issue has been regarded as a major difference between natural science and design science by Herbert Simon (1969), and recently by design researchers (Collins, Joseph, & Bielaczyck, 2004).

Thus, as noted in the previous chapter, the focus of this research was to gain a better understanding of pedagogical agents as a means to embed instruction within a computer-based
inquiry learning environment. Instead of arguing whether a pedagogical agent is beneficial for learning, the researcher attempted to articulate how pedagogical agents could be applied to address a specific learning goal, and what instructional method should be embedded to make the approach work.

**Seductive details**

The notion of “seductive details” may help to explain why and how pedagogical agents work. Seductive details (or seductive augmentation) refer to interesting but extraneous materials that are irrelevant to the learning goals in a multimedia instruction (Harp & Mayer, 1998). Similar to the pedagogical agent study, previous studies have claimed that seductive details have a positive influence on students’ interest, attention, and enjoyment (Park, 2005). Other studies have concluded that seductive details affect learning performance negatively (Garner et al., 1991; Harp & Mayer, 1997) have indicated a lack of relationship between seductive details and learning performance (Shirey & Reynolds, 1988).

Seductive details have been examined by other researchers in terms of “situational interest”. Schraw, Flowerday and Lehman (2001) defined situational interest as “temporary interest that arises spontaneously due to environmental factors such as task instructions or an engaging text” (p. 211). Previous studies indicate that situational interest can be increased by providing students with flexibility of choice, meaningful learning goals, and access to appropriate background information (for a detailed review, see Schraw et al., 2001). If triggered, situational interest can increase learners’ personal interest, which is less spontaneous and internally activated.

Schraw referred to Kintsch’s notion of emotional interest and cognitive interest (1980) to categorize the nature of situational interest. While emotional interest relates to learners’ personal affective reactions, cognitive interest relates to learners’ degree of comprehension of information.
Emotional interest is evoked by information that involves the learner emotionally, while cognitive interest is relevant to the structure of information, which stimulates learners’ attention or curiosity to know more. Schraw suggested that while seductive details can stimulate situational interest, they do not necessarily aid in comprehension of the main idea of the text. Rather, they are more likely to stimulate a personal response or holistic interpretation of the text (Schraw, 1997). If so, the use of pedagogical agents may not help to gain a better performance on content comprehension. It may be necessary to use other measurement criteria to evaluate the use of pedagogical agents.

**Peer learning agent**

The role of the agent gives another chance to consider how pedagogical agents can be designed to provide further instructional support in a computer-based environment. While most previous studies have only looked at the use of mentor, coach, and teacher types of agents, others have investigated the changing role of pedagogical agent from mentor to peer learner or companion (e.g. Chan & Chou, 1997; Ebbers, 2007; Kim & Baylor, 2006; Ryokai, Vaucelle, & Cassell, 2003; Vizcaíno, 2005). Promoting the use of peer learning agents is based on theories involving the social aspect of human learning, such as Vygotsky's “zone of proximal development” (ZPD) (Vygotsky, 1978) and Bandura’s social learning theory (Bandura, 1997). ZPD basically means that if a less competent person is assisted by a more competent person, the level of performance will increase. Vygotsky's perspective on this social aspect of learning prompted researchers to develop an instructional approach that featured the notion of scaffolding (Wood, Bruner, & Ross, 1976).

Bandura emphasized the importance of surrounding oneself with other people when learning, as this brings another layer of meaning to the context. Peers can learn from each other in
various ways. Observing a peer’s action is one way, and interacting with peers is another way. Bandura conceptualized the characteristics of learning in a social context with the terms “social modeling” and “vicarious learning” (Bandura, 1997).

Webb and Mastergeorge (2003) pointed out that receiving and giving explanations in peer learning serves as a fundamental function of scaffolding in two ways. One is that the explanation by the more capable person helps the less capable person to correct misconceptions and develop new skills. Piaget also pointed out that the flat relationship between peer learners plays an important role in facilitating learning, as it enables both persons to give and receive benefits (Piaget, 1976). The other is that explanation works as a way to reorganize one's own thinking and help to construct knowledge through the process. This aspect of scaffolding is supported by Vygotsky's perspective of externalization. Vygotsky claimed that encouraging learners to talk through their reasoning process could improve their cognitive ability (Vygotsky, 1978).

The application of pedagogical agents may produce this social learning aspect in a self-learning context. Since the social context is not limited in teacher-learner interactions, it may be worthwhile to take the peer learning aspect into account when designing the interactivity of agents. For example, if peer interactions produce different effects from teacher-learner interactions, creating a learning environment that enables learners to interact with both teacher and peer learners may have a different impact on learning. In a classroom environment, students are exposed to multiple levels of interaction constantly. A teacher throws a question to a student, and the student responds. Just as the student learns from the interaction, other students also learn from it by observation. Previous studies indicate that observation yields better performance than studying alone or just performing without observation (S. Y. Okita & Schwartz, 2006). Instead of just providing direct instruction or practice opportunities, letting students observe others may be a
possible approach to help students learn. Therefore, in this computer-based instruction, pedagogical agents play the roles of teacher and fellow students.

Conclusion

This chapter reviewed previous studies in order to address how to create a learning environment to support students acquiring essential skills when conducting historical inquiry. Historical inquiry requires a domain-specific thinking process. Therefore, the learning environment for historical inquiry requires specific domain-related approaches as well as a specific scaffolding strategy to address the challenges discussed in this chapter. For example, as historical thinking usually requires the investigation of multiple sources to make an interpretation, students should be provided with a large selection of information in order to perform their best. However, if the students feel that the information is overwhelming, they may restrict their research and conduct minimal fact finding just to finish the assignment, instead of engaging in the process of inquiry as expected. Although using multiple primary sources as an instructional approach for historical thinking can be beneficial for learners, additional instructional supports have to be provided so that they don’t become overwhelmed by the information. For those students in need of additional support, further clarification on instructional strategy is needed.

While various approaches may be applied to address this problem, all approaches have their strengths and weaknesses. A teacher-led classroom lecture using a traditional history textbook is good at delivering factual information and covering many topics in order to teach a large number of students in a short time. However, students tend to accept such information passively as if they are single correct facts, and tend not to think critically based on given information. Assigning project-based inquiry tasks to students in a classroom setting may be another possible instructional approach. Most previous educational technology studies for history
education referred to in this chapter focused on this approach. This approach has the advantage of engaging students in the task, and the collaboration it fosters among students helps them to gain new knowledge and apply this knowledge to solve the problem. However, it requires teachers to gain new skills and put forth more effort when facilitating the classroom activity in order to support students properly. Also, students are not necessarily accustomed to such collaboration with other students. Students who are not familiar with group collaboration may have difficulty in communicating with others and tend to need more time to appreciate the advantage of this approach.

Since an inquiry-based approach usually requires facilitation and flexible feedback on the part of the teacher or tutor, the individualized learning context does not seem to be an ideal setting at first glance. That may be partly why such a context has not been studied previously in depth. To address the absence of human support, researchers of computer-based instruction derived some alternative approaches. Previous studies indicate that pedagogical agents and story-based instruction can be the key instructional approaches to take into account.

Pedagogical agents are virtual characters that deliver instructional support in computer-based learning environments. They may be used to substitute for human support by simulating teacher facilitation and instant feedback and generally restoring the social aspect of learning in individualized learning environments. Although pedagogical agents have been studied in various fields, many of these studies focused on the effectiveness of applying agents regarding their appearance and communication style. Very few studies have focused on how to apply them to teach inquiry skills, and none of them have been studied in history education.

On the other hand, there are two reasons to consider story-based instruction as a key design approach for historical inquiry. First, story-based instruction of computer-based instruction has utilized visualized characters to deliver instruction in various forms, including story-teller, protagonist of the scenario, and virtual mentors. While such characters can be considered
pedagogical agents in a broader sense, they may not have been particularly designated as a means to embed instructional support. Second, story is used as a form to describe the problem context and to deliver instruction. Characters in the story help to enhance the social aspect of the learning context and to engage learners in the learning activity. Activities in historical inquiry require learners to understand historical narratives and to construct narratives to explain how they interpret the narratives. In this way, story-based instruction to provide learners with the problem context and learning tasks in a narrative format may be a viable approach to familiarize learners with the narrative-oriented nature of historical inquiry.

Therefore, this research focused on designing a learning environment by integrating story-based instruction and pedagogical agents as means to deliver the problem context and learning tasks as well as embed an instructional support in an engaging way. From a story-based instruction standpoint, this research suggests taking a closer look at characters in instructional stories. As a pedagogical agent study, this research explores the potential of pedagogical agents in a contextually-enhanced setting.

The remainder of the thesis describes the iterative design research process that required conducting a series of experiments, and discusses the findings and the lessons the researcher learned throughout the research process.
Chapter 3
Methodology

Introduction

The goal of this chapter is to illustrate the research context, the research approach and rationale, and the initial design of the inquiry learning environment. First, the context of the research and the problem to be solved are described, along with the rationale of the prototype design. A preview of the overall research process is then presented.

To set up a foundation for further discussion, the next section describes the design goals and the rationale behind them. The instructional materials and measurement tools used in this research are also described. To close, the overall research process is summarized.

Design goals and rationale

The purpose of the research was to design and evaluate a web-based, self-learning environment intended to guide and support students in investigating and interpreting historical materials. The challenge was how to guide students to overcome their difficulties in the process of inquiry and how to help them understand the materials deeper by explaining historical phenomena with reasonable interpretations. While there are a number of ways to design a learning environment to meet such goals, the researcher chose story-based instruction with embedded pedagogical agents as the method to support students during the inquiry process.

There are two main reasons this approach was chosen. First, the researcher recognized the potential of designing a practical self-learning environment for historical inquiry. As noted
earlier, the majority of previous studies on inquiry learning focus on the use of technology in classroom and collaborative learning settings. However, this requires both teachers and learners to change their old habits. Implementing new technology is simply difficult, even if designed well. Thus, this research focused on designing a web-based learning environment that can be used by students individually outside the classroom setting (for example, as part of a homework assignment). To design a self-learning environment that does not require direct teacher instruction or collaboration with peers may not be enough to provide students with multiple historical sources and learning tasks. Distance education studies deal with this type of issue (e.g. Gunawardena & McIsaac, 2004). Holmberg (1989) suggested that adding simulated conversations to self-instructional materials is an important strategy to help students excel in self-learning environments such as self-paced online distance learning courses or so-called “e-learning” training courses. Thus, additional instructional supports may be necessary to hold students’ attention and engage them in the learning activity. This research suggests that stories to provide contextual information and simulated interactions with virtual characters may be useful additions.

Second, enhancing social elements in a self-learning environment may be a key to engaging the “empathy” of students. Empathy refers to the cognitive awareness of other persons’ perspectives and situations (McQuiggan & Lester, 2007). In history education, such awareness is called “historical empathy” and has been debated by researchers (Davis, Yeager, & Foster, 2001; Foster, 1999; Lévesque, 2008). Historical empathy refers to the development of learners’ cognitive and affective abilities to accurately interpret and perceive historical figures and events (Colby, 2008). Students who lack empathy tend to interpret historical sources only through the lens of modern, prevailing values and are unable to consider other possible perspectives (Brooks, 2008; Wineburg, 2001). While some researchers claim that embedding pedagogical agents in the learning activity can foster students’ empathy (Duggan & Adcock, 2007; Kim & Baylor, 2007), further research is needed to explore this potential of pedagogical agents.
Research questions

The following three research questions were taken into account when designing and evaluating the inquiry learning environment:

(a) Does the use of different scaffolding strategies embedded in story-based pedagogical agents have an impact on learners’ content comprehension in a web-based historical inquiry learning environment?

(b) Does the use of different scaffolding strategies embedded in story-based pedagogical agents influence the learners’ historical reasoning as measured in an essay writing task?

(c) Does the use of different scaffolding strategies embedded in story-based pedagogical agents have an impact on learners’ perceptions of the learning activity in terms of enjoyment, interest, attention, difficulty, and efficacy?

These questions served as guides during the design iterations. The comprehension test and essay writing test were assigned to detect different levels of learning performance, and learners’ perceptions were collected through the self-report questionnaire. Instead of just testing these questions in the study, the design was reviewed in light of these questions throughout the research.

Specifying instructional goals

While the researcher expected story elements within the learning environment to engage students and deepen their understanding of the material, it was not certain if story elements alone would have such effects on learning. Therefore, it was deemed necessary to examine if adding a story by applying the same instructional support would have any influence on students’
performance and perception of the lesson. As a result, additional instructional supports were
designed iteratively and examined through the following experimental studies.

While general guidelines exist for designing story-based instruction, design details must
be considered in light of the specific problem context, since the context largely affects the
characteristics of the learning environment. To address this, instructional goals of the design
should be specified from the start, as questions of what to convey, how to convey, and how much
to convey require instructional designers to reflect closely upon the context. Therefore, a
prototype learning environment with minimal features was employed to help expose possible
issues and difficulties. The preliminary instructional goals were set as follows:

1. Condensed, yet focused, time period for the intervention. As a prototype design was
   used, it was necessary to start simple to allow for greater efficiency and flexibility in
   the development process. Therefore, a time limit of one hour was set.

2. Students exposed to historical content and inquiry skills. Despite being a short lesson,
   it had to offer enough material to allow students to conduct a thorough historical
   inquiry that included investigating historical sources, interpreting them, and
   developing arguments based on evidence.

To address these instructional goals, the content of the lesson module was first
determined. While any history themes could have been used, Japanese medieval history was
chosen for two main reasons. First, Japanese history is a relatively unfamiliar history domain for
undergraduate students in the United States, which worked in the researcher’s favor. As prior
knowledge on the subject would likely have affected the results, it was desired to find research
participants who had little or no prior knowledge. Because so few students have knowledge of
Japanese history as compared to American history, it was easier to recruit such participants.
Second, this research began as an unfunded solo project with little money and time to devote to
content development. Consequently, the researcher decided to utilize his familiarity with the domain of Japanese history in order to cut costs and save time.

**Lesson materials**

The lesson materials prepared for the inquiry include the history of Taira no Kiyomori, a courtier and warlord who became the first chief minister of the imperial court government in late 12th century Japan. The materials were carefully chosen by the researcher and reviewed by an expert in Japanese history. The selected documents illustrate the controversial historical context regarding the rise and fall of Taira no Kiyomori’s reign. Although Taira no Kiyomori held the highest position in the imperial court and boasted more accomplishments than any other warrior, he was described as a vicious, cruel dictator in the epic poem *The Tale of the Heike*. *The Tale of the Heike* is considered one of the major historical sources of the era. Multiple primary and secondary sources, such as pictures and essays written by the people of the era, and historical narratives written by a historian in later periods, are presented in the lesson. The documents contain information regarding Kiyomori's situation from different perspectives, each describing his positive and negative characteristics in political and personal matters. The following are descriptions of the documents that were used for the lesson:

1. An illustration drawn based on the story found in *The Tale of the Heike*: The picture (excerpted from Nakano, 1980) was used in the introduction to indicate how Kiyomori was described in the tale. The picture dramatically portrays Kiyomori suffering from a painful fever and depicts the Buddhist Judge of the Dead as causing his suffering.

2. A timeline of Kiyomori’s history: The timeline was provided to give learners an overview of the historical context at the beginning of the inquiry. It indicates important events in Kiyomori's life and after his death in chronological order. It includes his various
accomplishments, such as his victory against a rival clan, his rise to power in the imperial court, and his staging of a coup d’état following a personal tragedy.

3. An excerpt from *The Tale of the Heike* (Document 1): The excerpt describes a letter sent by Buddhist monks in 1180 requesting an alliance to rebel against the Taira clan and censuring Kiyomori's tyrannical act against the Buddhist temples and the imperial family. While the excerpt can be considered a primary source, it was written as an epic poem performed by lute priests and was enjoyed as entertainment. Ideally, this fact should provoke students to question the reliability of the source, with the reasoning that it may have been exaggerated or distorted for the sake of entertainment.

4. A historian’s essay (Document 2): A document written in the late 20th century by a historian explaining the severe situation of Kiyomori when he staged the coup d’état. The essay offers an impartial perspective by examining the possible causes of Kiyomori’s radical acts to sustain power. For example, it recounts the death of Kiyomori’s daughter, who was married to the emperor. Following her death, Go-Shirakawa was able to regain his political power by taking ownership of their land. The essay also discusses the Taira clan's vulnerable political situation in the imperial court.

5. A set of excerpts from historical essays (Document 3): A document that describes Kiyomori's considerate and kind character, which was not reflected in the other documents. The document consists of excerpts from an historical essay composed by a Buddhist priest and a collection of anecdotes composed in the 13th century. An excerpt from *The Tale of the Heike* that describes Kiyomori's accomplishments is also provided in the document as supplementary information.

These materials were organized as a lesson module for inquiry learning without any additional instructional elements. The module was designed as a self-paced learning activity to be
completed in approximately 50 minutes by novice learners who did not have any prior knowledge on the topic. Figure 3-1 charts the overall picture of the lesson structure.

![Figure 3-1: The basic structure of the lesson content](Image)

**Initial design of the lesson modules**

Based on the instructional goals and materials described above, a lesson module was designed using Adobe Flash 8. The lesson module begins with an introduction that gives background information and states the mission for the inquiry (Figure 3-2). In the introduction, students are provided the background information and asked to make an argument as to why Kiyomori was described as a villain and how his problems could have been prevented. Students can click on the links to investigate the documents. Each document page has a button that links to a message prompt, which supplies the student with clues and helpful hints.
The lesson module was designed with a story-based pedagogical agent to provide students with additional contextual information and guidance. It featured a mentor-type virtual character named Sessai (Figure 3-3).
Sessai supports students with guiding questions to help them explore the virtual environment of 16th century Japan. At the beginning of the lesson, a fictional cover story describing the problem situation is provided to the student. The story is based in 16th century Japan, a time known as the Age of Warfare. In the story, students are assigned the role of assistant to Sessai, the chief general of one of the strongest warlords of the era, Imagawa Yoshimoto. Sessai assigns the student the mission to investigate Taira no Kiyomori's history for Yoshimoto. Sessai explains that Yoshimoto wants to know why Kiyomori was described as a villain and why his accomplishments were overlooked. After Sessai’s briefing, the student must start searching for information to report back to him. The lesson pages consist of several sites in the story such as archive, shrine, and tea house. Students can browse the lesson pages to explore those sites and collect information.
Design of the pedagogical agent

To investigate the impact of the design of the lesson module in terms of the research questions, another lesson module was designed for the control condition using the same materials (Figure 3-4). There were two major differences between the control and treatment conditions. First, the treatment condition consisted of a story-based instruction, while the control condition consisted of a brief introduction and directions to guide learners investigating the lesson materials described in the previous section.

![Introduction](image)

Figure 3-4: A screenshot from the lesson module for the control group (Study 1).

The treatment group required learners to read an additional cover story described above before attending the inquiry (the scripts can be found in Appendix A). While the additional cover story is not directly relevant to the learning task, it describes the fictional mission (Sessai asks learners to report their answers to the warlord) used to make the task more engaging (Figure 3-4). These story elements provide contextual information along with the problem and learning tasks,
whereas the control condition consists of a brief introduction page to directly convey the problem context and tasks.

In the treatment group, additional characters exist in the story (Figure 3-5), and learners are required to collect information from them.

![Figure 3-5: Example of a virtual character in the treatment group (Study 1).](image)

The available information consists of the same materials given in the control group. The learners in the treatment group conduct inquiry as if they are actually collecting information in the virtual environment, whereas those in the control group can access the same information just by flipping the webpage (Figure 3-6).
Second, regarding the pedagogical agents, the main character Sessai was used as a mentor-type pedagogical agent. As discussed in Chapter 2, previous studies have indicated that pedagogical agents can embody various pedagogical roles. However, most of those roles have had the agents acting as teachers, coaches, or mentors that explicitly provide instruction, e.g., lecturing, demonstrating real-life examples, gesturing to indicate non-verbal expressions and directions, and providing just-in-time feedback. Clarebout and her colleagues pointed out that these roles consist of support functions that include (a) executing, (b) showing, (c) explaining, and (d) questioning (Clarebout et al., 2002).

In this research, Sessai was designed as a mentor-type agent with some instructional support function, but his main role and instructional support functions were coordinated into the story plot and learning tasks. Specifically, he (1) explained the learning context and tasks at the beginning of the lesson, and (2) provided learners with related information and guiding questions.
that appeared as pop-up message prompts on the screen when requested. To examine if the story element and the existence of the mentor agent had an impact on the learning outcome, the information and message prompts were basically the same as those for the control group except the scripts in the treatment group were adjusted to suit Sessai’s conversation style (see Table 3-1 for examples). The story and the agent were incorporated in order to make the instruction embedded in the agent more contextually relevant.

Table 3-1: Guidance script examples of the control and treatment groups (Study 1).

<table>
<thead>
<tr>
<th>Control</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Browse the timeline to find out the point where Kiyomori had faced challenges.</td>
<td>Sessai: Do you need my help? OK. First, look at the point where Kiyomori had faced challenges.</td>
</tr>
<tr>
<td>2. Find out when his relationship with the retired Emperor Go-Shirakawa had changed.</td>
<td>Second, who is the important person here? You should see it is the retired Emperor Go-Shirakawa. So find out when he and Kiyomori's relationship had changed.</td>
</tr>
<tr>
<td>3. Answer Q1 and Q2 below.</td>
<td>Then, write your answers for Q1 and Q2 in the report below.</td>
</tr>
</tbody>
</table>

Sessai was designed as a pedagogical agent using still images and text-based messages – without using voice narrations or animations. As this research did not intend to investigate the persona effect of pedagogical agents nor the quality of the agent's intelligent reaction, perfecting the visual design or lifelikeness of the agents was not a high priority. Rather, the main purpose of this research was to understand the impact of the instructional strategy embedded in the agents. While various technologies to enhance the agents were available, most of these technologies require unnecessary complexity. For example, 3D virtual world platforms could have been used to give Sessai a more realistic appearance. However, this was not perceived as necessary for the research focus. Scripted responses joined with still images were deemed adequate. Taking into account that aesthetics can have an influence on learners’ affective reactions (Parrish, 2009; Veletsianos, 2007), visual images of the characters and learning environments were designed to “look good” and be contextually relevant to the learning environment.
To compensate for the agents’ lack of visual aesthetics, images were adopted from a popular commercial video game concerning medieval Japan produced by a Japanese game company. The images were chosen based on their relevance to the subject (Japanese medieval history) and learning context (conducting historical inquiry in medieval Japan). The researcher received copyright permission to use the images for the research. The images were combined with dialogue scripts so that they would appear to be “talking” to learners (Table 3-2 show an example of the dialogue script). While the images for the control group were only used to deliver content information (e.g., a picture of a temple), the images for the treatment group were not directly relevant to the learning content. They were also used to illustrate contextual information and embody pedagogical agents in order to create a more personalized interaction.

Table 3-2: Script to introduce the instructional materials.

| Scholar: | Hello. This is the archive of the Imagawa clan. I heard you are looking for information about Taira no Kiyomori. You may feel free to look around our archive. Ask me when you have any questions. |
| Learner: | (Click to choose) Do you have any information about Kiyomori? |
| Scholar: | Yes, if you don’t know much about Kiyomori, I believe this would give you a clue about him. Take a look at this. (-> Check the document.) |
| Learner: | (Click to choose) Do you have any other documents? |
| Scholar: | Yes, of course. We have the Tale of the Heike here. The Tale of the Heike (or Heike Monogatari) is an epic poem composed in the 13th century. There are several slightly different versions. I think this part is what you need. Here it is. (-> Check the document.) |

Overview of the research process

The research was conducted during the summer of 2008 to the spring of 2009. Four experimental studies were conducted, including a developmental user-test that showed how the story-based pedagogical agents worked and what variables made the design better or worse. The prototype design and interfaces were modified throughout the studies and reflected the results of
each previous study, as each was set up based on the results of the previous study. Each also tested the influence of the independent variables upon the dependent variables. The overview of the experimental studies is summarized in Table 3-3.

Table 3-3: Overview of the experimental studies.

<table>
<thead>
<tr>
<th>Study 1: development al user-test (September 2008)</th>
<th>Participants</th>
<th>Treatment</th>
</tr>
</thead>
</table>
| Study 2 (October 2008)                           | 37 (Control: 19, Treatment: 18) | Control: Inquiry learning environment without story elements and agents  
Treatment: Inquiry learning environment + story-based pedagogical agent (mentor agent)  
Main difference: - story-based instruction  
- personalized message via a mentor agent |
| Study 3 (December 2008)                          | 35 (Control: 17, Treatment: 18) | Control: same as Study 1  
Treatment: Inquiry learning environment + story-based pedagogical agent (mentor & peer agents)  
Main difference: - story-based instruction  
- modeling  
- practice opportunity for historical thinking |
| Study 4 (April 2009)                             | 75 (Control: 26, T1: 26, T2: 23) | Control: *same as Study 1  
Comparable: Inquiry learning environment + story-based pedagogical agent (mentor agent)  
Treatment: Inquiry learning environment + story-based pedagogical agent (mentor & peer agent)  
Main difference: - story-based instruction  
- modeling  
- practice opportunity for historical thinking  
- evaluation exercise (Treatment only) |

Because it was assumed that the participants had little or no prior knowledge of the subject of the lesson, a pretest performance may have produced poor results in this population. Thus, a posttest-only experimental design with mixed data analysis methods was employed for all studies. Study 1 was conducted to test the usability and operations in the administration process of the study sessions. The prototype modules for the control and treatment groups were modified after the study.
Study 2 was conducted to compare the lesson modules with and without an additional story element and a mentor-type pedagogical agent. The agent was personified as a story-teller and coach to provide learners with guiding message prompts. The control group was designed using the same lesson materials and guidance message prompts, although the style used in the treatment group was more conversational in order to see if the addition of the story element and the inclusion of the agent would have an impact on the results.

Based on the mixed results from the data collected in Study 2, the design of the pedagogical agent was modified and a peer-type agent was designed and integrated into the module. The mentor and peer agents were designed to provide learners with instructional supports to conduct historical investigation. The mentor agent offered pointers on how to conduct investigation for the activity, such as what to consider when comparing the documents. The peer agent provided learners with further assistance through guiding questions and “mistakes” intended to teach learners. Study 3 was conducted to evaluate how the design modifications influenced learners’ performance and affective disposition following the same format from Study 2. In Study 4, the researcher designed another treatment by removing the peer learning element to see how and if the element influenced the learners. These three different types of treatment groups were assessed using the same data collection approach.

The results of Studies 2, 3, and 4 indicate how the design modification influenced the learners, and are described in the next chapter. As an introduction to the results, the next section describes the design of the first prototype and experiment.

Study 1: Initial prototype design

During the initial prototyping phase, a formative pilot study (Study 1) was conducted at the Pennsylvania State University in September 2008. The purpose of this pilot study was to see
if the lesson could be completed within the expected time range, and to detect and modify
problems regarding the lesson content, measurement tools, and the administration process of the
experiment. Nine volunteer students were recruited from a Japanese history course and
participated in the study. They were offered $10 for the completion of the required process.

The participants were asked to conduct an inquiry activity in the web-based lesson
module and answer the posttest questions. During the activity, they answered eight short-answer
questions delivered by way of message prompts and presented an argument in response to an
essay question (see Table 3-4). After the lesson, the participants offered their positive and
negative impressions regarding the lesson.

Table 3-4: Questions asked during the learning activity (Study 1).

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>When is the turning point for Kiyomori facing his downfall? and why?</td>
</tr>
<tr>
<td>2</td>
<td>From the timeline, what can you tell about the relationship between Kiyomori and the retired Emperor Go-Shirakawa?</td>
</tr>
<tr>
<td>3</td>
<td>What is the intention of the letter?</td>
</tr>
<tr>
<td>4</td>
<td>Why did the Buddhist monks rage against Kiyomori?</td>
</tr>
<tr>
<td>5</td>
<td>What was the issue Kiyomori was facing at the moment?</td>
</tr>
<tr>
<td>6</td>
<td>What is Kiyomori's or the Taira family's weakness? and why?</td>
</tr>
<tr>
<td>7</td>
<td>How is Kiyomori's character described in the documents?</td>
</tr>
<tr>
<td>8</td>
<td>What difference do you find about Kiyomori's character compared with other documents?</td>
</tr>
</tbody>
</table>

Essay question:
Based on your findings, compose an essay to make your argument for why Kiyomori was described as a villain, and why Kiyomori acted to be disliked? Make sure to use and cite evidence from the documents you investigated to support your argument.

During this phase, the prototype was continuously modified. First, user-interface issues were addressed. The participants’ comments revealed that some navigation buttons to flip the webpage were confusing. Thus, they were made more distinct and relocated to the same places on each page. The font size of the text was adjusted to reduce page scrolling, and the size of the screen was enlarged in order to make use of the screen space. Some of the message prompts for direction and source information in the control group were combined to reduce redundancy.
Short-cut menu buttons on the top of the screen in the treatment group were also modified to reduce unnecessary switching back and forth actions (see Figure 3-7 and 3-8).

Figure 3-7: Modified version of the control group (Study 2).
Second, minor grammatical errors were corrected. Although the content was checked by a native English speaker, grammatical typos and confusing directions remained as they were. Third, the short-answer questions (see Table 3-3 above) were converted to multiple-choice questions. It was anticipated that the text data from the questions would be massive in the next study. It was also a concern that the students would take too much time to answer all of the questions. Although the text data may contain meaningful results, it is not easy to measure and make use of them. Thus, it was decided to collect text data from the essay questions and to prepare multiple-choice questions to measure the content comprehension. The following section describes the measurement tools for the next study.
Measurement tools

To assess learners’ performances and subjective impressions regarding the learning activity, the following measurement tools were constructed (see Appendix B for the entire content).

(1) Multiple-choice test: 14 multiple-choice questions were constructed to measure students’ content comprehension. Rather than simply asking for specific facts, the questions were carefully constructed to measure conceptual understanding of the causal relationships among the historical events described in the lesson. Most of the questions can be answered correctly without having to remember exact facts, as long as students are able to grasp the contextual relationships of the historical figures and phenomenon, and the causes and consequences of the major events. Table 3-5 gives examples.

Table 3-5: Example questions from the multiple-choice test.

Q. Which of the following describes Kiyomori most accurately?
A. He led the Taira clan to fight the rival Minamoto clan, but his clan was defeated by them in the end
B. He was the first courtier to establish a military government separate from the imperial court in Kamakura
C. He grabbed political power in the imperial court successfully, but he was assassinated by the outraged Buddhist monks
D. He sponsored the construction of a new Buddhist temple after burning down the old ones that opposed to him

Q. Which of the following describes most likely the Buddhist monks’ view of Kiyomori?
A. We have to stop Kiyomori's usurpation of the imperial court and upon Buddhism
B. We are grateful to Kiyomori for sponsoring the construction of our temple, but we cannot stand his sons' usurpation of our privileges
C. We are outraged not just by Kiyomori, but by all of the warrior clans who brought the imperial court into confusion
D. We should take advantage of the confusion Kiyomori caused and gain our privileges in the imperial court
(2) An essay test: As this research concerned students’ ability to investigate, interpret, and explain a historical account based on evidence, a multiple choice test would not be adequate to evaluate these skills. Accordingly, an essay test was constructed. The question asks students to explain why Kiyomori was described as a villain and how he could have prevented himself from gaining such a reputation. The question requires students to analyze the historical figure’s situation from multiple positions and to contextualize the historical events in order to distinguish causes and consequences. Table 3-6 shows the essay test question.

Table 3-6: The essay test question.

Q. If you are asked your expert opinion by a warlord (or a politician) who wants to learn from Kiyomori’s history in order to make his own political career better, what would you suggest to him? First, explain why Kiyomori was described as a villain. Then explain how he could have prevented from gaining such a reputation.

(3) Post-survey for student perceptions of the activity: To collect students’ feedback on the learning activity, a self-report questionnaire was constructed consisting of 10 multiple-choice questions that rated enjoyment, interest, attention, difficulty, and efficacy followed by two open-ended questions intended to draw out student impressions. This self-report questionnaire investigated students’ subjective perceptions and attitudes along a 5-point Likert-type scale. Table 3-7 contains the questions.

Table 3-7: Post-survey questions.

Please tell us your thoughts and impressions about this activity. (5-point Likert-type scale: 5: strongly agree -- 1: strongly disagree)

Enjoyment:
Q. I enjoyed this activity.
Q. I rather enjoy reading textbooks than learn with this kind of activity

Interest:
Q. I am more interested in Japanese medieval history after this activity
Q. The material was interesting for me to engage in the activity
Attention:
Q. The activity was interesting for me to keep attention.
Q. The way the information is arranged on the pages helped to keep my attention.
Difficulty:
Q. The difficulty level of this activity was appropriate for me
Q. The material in the content was difficult to understand.
Efficacy:
Q. I learned something new through this activity.
Q. I feel activities like this can improve my history study skills
Overall positive / negative impression: (free-answer questions)
Q. What did you like about this activity?
Q. What did you NOT like about this activity?

General procedure of the studies

As noted earlier, Studies 2, 3 and 4 were designed as posttest only experiments and were conducted at the Pennsylvania State University between fall 2008 and spring 2009. The research participants were recruited from an introductory Japanese language course (Studies 2 and 3), and from a general education course in material science and engineering (Study 4). The participants in Studies 2 and 3 were offered $10, and those for Study 4 were offered extra credit for their course grade as an incentive to participate. For Studies 2 and 3, the Japanese course was chosen as a recruitment venue because it was assumed that the students taking the course were more interested in learning about Japanese history and culture than the general population. As it is usually difficult to recruit an adequate number of research volunteers even if cash is offered, the increased likelihood of participation from this group was essential for the recruitment process. For Study 4, participants with presumably less interest in Japanese were recruited from a general education course. Such participants were needed to get accurate feedback from a more general audience.
Undergraduate students who agreed to participate in the experiment were asked to sign up for available timeslots and report to a designated lab to participate in the experiment session. Each participant was randomly assigned to either the control group or treatment group. For the control group, an inquiry learning environment without story-based pedagogical agents was used in each study, and for the treatment group, an inquiry learning environment featuring story-based pedagogical agents was used in each study. A comparable group, a modified version of the treatment group without the peer learning elements, was added to Study 4 to evaluate the possible impact of peer learning elements in other conditions. Details of the conditions are described in Chapter 4.

At the research venue, the participants were seated at a computer and given informed consent documents, which were collected before beginning the session. The lesson module was stored and presented in the University’s Course Management System. The administrator instructed the participants to log into the system, and asked them to complete the pre-survey to collect basic information and preferences regarding their learning history. After completing the survey, participants were instructed to complete the lesson activity at their own pace. The participants answered the essay questions during the learning activity, and the multiple choice questions after the activity (Study 2 allowed students to answer during the activity, but Studies 3 and 4 were closed-book). After completing the questions, they were asked to answer the post survey questions regarding their subjective perceptions of the activity.

**Summary**

This chapter presented the design context of the research and the overall research process. The challenge was how to design a self-learning environment that guides students in reviewing and interpreting multiple sources critically. The design approach applied in this research was
embedding story-based pedagogical agents to support students in the process of inquiry. A mentor-type agent was designed to deliver the mission and enrich the context of the learning environment, as well as pose guiding questions to students. The next chapter describes and discusses the results of Studies 2, 3, and 4.
Chapter 4
Results and discussion

Introduction

This chapter presents the results of three experimental studies and examines the influence of applying story-based pedagogical agents in a web-based inquiry learning environment. This research evaluated the following potential influences on students: (a) learning performance in content comprehension; (b) learning performance in essay writing; and (c) subjective perception toward the inquiry learning activity. Since the research was conducted as design research, the results of the experiments as well as the descriptions of the iterative design process were regarded as part of the outcome. Thus, reflections on the design iterations at various stages of the process are detailed along with the general results.

The results of each study include (1) a report of the responses to the multiple-choice questions on content comprehension (2) a qualitative analysis of students’ answers to the essay questions, and (3) a summary and analysis of student feedback in the self-report questionnaire. SPSS Version 17 for Windows was used for the statistical analyses throughout the studies. An alpha level of .05 was used for all statistical tests.

Study 2: Do the story element and mentor-role agent make a difference?

As mentioned in Chapter 3, Study 2 was conducted in October 2008 after the pilot study (Study 1) to evaluate how the prototype worked. The main purpose of Study 2 was to determine the influence of applying story-based pedagogical agents in an inquiry learning environment by
comparing two different conditions (control group and treatment group). The treatment group was designed with story-based pedagogical agents, and the control group was designed without any agents. In Study 2, the pedagogical agents were characters in a story developed to provide the problem context for the learning task. The mentor agent, Sessai, was the main character of the story and provided conversational guidance messages on the document pages (Figure 4-1). Students explored the story-based environment by clicking around the lesson pages. When students clicked on the help buttons, Sessai appeared to give them guidance messages and questions.

![Figure 4-1: A guidance prompt provided by Sessai in the treatment condition of Study 2.](image)

The control group received background information on the problem and the learning tasks without the story elements and the agent, which were only present in the treatment group.
The guidance message prompts in the control group were modified to be instructional rather than conversational (Figure 4-2).

![Figure 4-2: An instructional message prompt provided in the control group for Study 2.](image)

Thirty-nine students participated in the research session. After being randomly assigned to either the control or treatment group, participants answered pre-survey questions enabling the researcher to collect demographic data. When they conducted the learning activity with the lesson module, they answered multiple-choice questions to measure content comprehension and an essay question to measure historical reasoning. After the lesson, the participants were asked to answer a self-report questionnaire enabling the researcher to assess their perceptions of the learning
activity in terms of enjoyment, interest, attention, difficulty, and efficacy, followed by two open-answer questions to gather positive and negative impressions. The overview of the procedure is described in Figure 4-3 (the details of the procedure are described in the general procedure section of Chapter 3). After careful review of the initial data, two participants in the treatment group were eliminated for failing to complete a number of required tasks.

![Figure 4-3: Overview of the procedure of Study 2.](image)

**Data collection**

The influence of both designs was determined by evaluating learning performances on content comprehension and essay writing, as well as student perspectives on the learning activity using the measurement tools described in Chapter 3 (the complete set of materials are shown in Appendix B). To confirm if the participants completed the lesson in the anticipated time range (about one hour), overall time on tasks was collected through the time log data retrieved from the learning management system. Essay word count was also checked to examine if there was a discrepancy in the amount of essay writing. The collected data were analyzed quantitatively and qualitatively. Table 4-1 summarizes the data types and measurement tools.
Table 4-1: Dependent variables and measurement tools.

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>Measurement tools</th>
<th>Analysis type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning performance on content comprehension</td>
<td>Posttest in multiple-choice questions (14 questions)</td>
<td>Quantitative</td>
</tr>
<tr>
<td>Learning performance on historical reasoning</td>
<td>Essay question</td>
<td>Quantitative &amp; qualitative</td>
</tr>
<tr>
<td>Perception of the learning activity</td>
<td>Self-report questionnaire (10 questions)</td>
<td>Quantitative &amp; qualitative</td>
</tr>
<tr>
<td>(enjoyment / interest / attention / difficulty / efficacy)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplemental variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Time on task</td>
<td>Time log</td>
<td>Quantitative</td>
</tr>
<tr>
<td>- Essay word count</td>
<td>Essay question</td>
<td></td>
</tr>
</tbody>
</table>

Data analysis

Learning performance

To identify the potential influence of applying story-based pedagogical agents, the quantitative results of learning performance including the comprehension test score, time on overall task, and essay word counts were compared between the students of each group. A one way analysis of variance (ANOVA) was used to examine significant differences of the comprehension test scores and other indicators between the control and treatment groups. The result of analysis indicated no significant difference between the two conditions on all of these dependent variables. The results are summarized in Table 4-2.

Table 4-2: Descriptive statistics for the learning performance in Study 2.

<table>
<thead>
<tr>
<th></th>
<th>Comprehension Test a</th>
<th>Time on tasks</th>
<th>Essay word count</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Sig.</td>
</tr>
<tr>
<td>Control (N=19)</td>
<td>11.05</td>
<td>2.778</td>
<td></td>
</tr>
<tr>
<td>Treatment (N=18)</td>
<td>10.11</td>
<td>2.541</td>
<td>.153</td>
</tr>
</tbody>
</table>
Although the differences were not significant statistically, the students in the treatment group gained fewer points on the comprehension test, spent more time on tasks, and wrote fewer words for the essay than those in the control group. This result indicates that the treatment group’s pedagogical agent was not sufficient in assisting student learning.

Qualitative analysis of essay writing

Students were asked the following questions in Table 4-3. The questions were intended to encourage students to identify multiple perspectives of the historical phenomenon, interpret the causes, and make an argument in their own words.

Table 4-3: Essay questions for Study 2.

Q1. Based on the information you found, compose an essay to make your argument for why Kiyomori was described as a villain? Make sure to use and cite evidence from the documents you investigated to support your argument.
Q2. If you are asked your expert opinion by a warlord (or a politician)* who wants to learn from Kiyomori's history to make his political career better, what would you suggest him? First, state the problem Kiyomori had, and then make your argument to resolve (or prevent from) the problem.

*Note: The character named “Imagawa Yoshimoto” was used in the treatment condition.

Instead of grading the essays based on predetermined criteria, the essays were analyzed using a microanalysis approach, which is a qualitative method used in the grounded theory approach (Strauss & Corbin, 1998) to identify patterns in the data. The purpose of the qualitative analysis was to identify characteristics of students’ historical thinking, such as the identification of a problem context, the interpretation of multiple sources, and the construction of historical accounts.
The microanalysis approach is a combination of iterative open coding and axial coding. Through an open coding phase, each data entry was tagged with conceptual labels that represented discrete parts contained in the data. The codes were determined based on the purpose of the study and relevant theoretical framework from the literature.

In this case, they were determined by how students identified the problem, how they reasoned their claim, and what common failures were found in their arguments. The list of Fischer’s historians’ fallacies (see Table 2-1) was referred to as a preliminary framework to detect possible codes. The researcher examined the list of fallacies in terms of the relevance to the study. Since students conducted inquiry in a limited problem context with much fewer materials than would be available for a historian’s inquiry, some of Fischer’s fallacies were screened out due to their irrelevance to the research context. For example, fallacies in question-framing, which are typically made in the phase of question-setting, were not applicable. Some of the fallacies related to political or ideological arguments, statistical analysis, and those found in larger inquiries were also omitted. As the learning activity assigned to the students focused on reasoning and explanation, the fallacies relevant to this process such as those dealing with factual verification, causation, generalization, narration, and explanations in motivation were referred to in order to detect potential codes.

During the open coding process, general codes to describe students’ reasoning and explanation process such as “analyzing the cause”, “generalization”, and “inferring motivation” were assigned to the applicable part of the texts. Other miscellaneous concepts that the coder happened to notice during the coding process were also retained to see if other possible categories existed. For example, some students offered quite opinionated judgments without justifying them with evidence, as below:

“I think that the reason which Kiyomori was described as a villain is his greedy and he against the emperor and temples. (P2A13)“
In such a case, the code “opinionated argument” was assigned. The researcher then conducted axial coding to connect the conceptual labels. The open labels were compared and contrasted to establish more overarching categories. For example, while several students accounted for Kiyomori’s morality by referring to his tyrannical acts, other students rationalized it by way of his strategic approach. The codes which may have contained an overarching category were contrasted to see if there were possible explanations to categorize them. If a missing value or possible interpretation was detected, another session of open coding and axial coding began. This iterative coding process was able to distill the qualitative data of the ideas and interpretations contained in the student essays into several conceptual categories.

Following the coding process, two additional raters examined the codes generated by the researcher to ensure their reliability. One third of the coded essays were randomly selected and reviewed by two independent raters to evaluate the appropriateness of the code categories and how they assigned each code to the data. The initial agreement of code assignment was 75%. The raters discussed any discrepancies they found and resolved them iteratively (Appendix D shows the final guidelines of coding). Then the researcher examined the remainder of the coding work. Based on the analysis, the following two code categories were identified.

1. Problem (act / situation): Acts refer to the attribution of Kiyomori's problem to his violent actions or tyrannical political decisions. Examples of acts (Table 4-4 shows examples of the code categories) include his rising against the rivalry clan, burning down the temple and attacking the Buddhist monks, seeking political power too fast, neglecting the provincial area to gain leadership in the central court, occupying the court government by putting his family in a higher-ranking position, staging a coup and house arrest against the former emperor, arranging a marriage between his daughter and the emperor, and stopping the conspiracy against his clan by killing the conspirators.
Situations refer to the attribution of Kiyomori's problem to the circumstances he was facing, such as mentioning issues other than his violent actions and tyrannical behaviors. In some cases, students just mentioned Kiyomori’s characteristics but did not make situational arguments. In such cases, a subsidiary code of the act called the “restricted act” was used and counted as part of the act.

2. Perspective (one-sided / multiple perspective): A one-sided perspective refers to an explanation that was made from a single perspective, without considering other possibilities (e.g., identifying Kiyomori as the sole cause of a disturbance). Multiple perspectives refer to an explanation that attributes an event to several causes (e.g., explaining that Kiyomori staged a coup for several different reasons, as shown in Table 4-5).

Table 4-4: Examples of the code categories

| (act / one-sided) | “He was described as a villain because he burned the Buddhist temple and arrested the Emperor. During the war with Minamoto clan he killed the Minamoto's previous leader. It instigated the rivalry between Kiyomori and Minamoto clan (P1A4).” |
| (act / multiple perspective) | Because he gained too much power in the court and arranged a marriage between the Emperor and his daughter to gain the political power. He also attacked the Buddhist monks. And he staged a coup d'eta and imprisoned the retired Emperor. He had too much power and did things what he supposed like. If people have too much power in government he will become autocratic. That will be no goodness to people in the country. So although he did some thing good to the country but because of his sovereign power he was described as a villain. (P1A2). |
| (Situation / Multiple perspective) | “As Kiyomori and the Taira attempted to keep their newly gained power distrust started to develop. With Kiyomori's daughter's death Kiyomori attempted to strengthen his political power by crushing those that opposed him which of course created enemies. A document also stated that the more the Taira tried to model themselves after aristocrats the more they engendered local distrust and hostility (P1B10)”.

Note: Misspellings in the data are left as they are.

Table 4-5: Possible points that students could have used in their arguments
- historiographical view (inferring author's stance/bias/propaganda)
- class issue (Aristocrats' prejudice against warrior class)
- unpopularity of Kiyomori and his family
- alienation from provincial warrior families
- Kiyomori's financial situation (caused by the death of his daughter and son)
- Kiyomori's good character (kind to his people)
- Kiyomori's accomplishments (sponsorship of construction projects)
- Hypothetical situation to argue a possible situation

Overall, in both conditions, there were students who attributed Kiyomori’s actions to the cause of his problem, and those who attributed Kiyomori's problem to the situation he was facing by giving a contextual perspective. Most of the students in both groups included multiple perspectives in their arguments. A Fisher’s exact test on the frequency analysis indicated that the distributions of the problem and perspective categories were not significantly different in the control and treatment groups (see Table 4-6).

Table 4-6: Frequency table of code categories in Study 2.

<table>
<thead>
<tr>
<th></th>
<th>Problem</th>
<th>Perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Situati</td>
<td>Act (%)</td>
</tr>
<tr>
<td>Control (n=19)</td>
<td>9 (47.4)</td>
<td>10 (52.6)</td>
</tr>
<tr>
<td>Treatment (n=18)</td>
<td>9 (50.0)</td>
<td>9 (50.0)</td>
</tr>
<tr>
<td>Total (n=37)</td>
<td>17 (48.6)</td>
<td>20 (51.4)</td>
</tr>
</tbody>
</table>

**Student perceptions of the learning activity**

Student perceptions of the learning activity were measured by the self-report questionnaire. The result showed a significant difference in the mean scores of enjoyment (F (1, 36) = 5.362, p< .05) and attention (F (1, 36) = 4.501 p< .05). There was an indication of moderate difference in interest in the activity, although it was not statistically significant (F (1, 36) = 3.665, p< .10). There were no significant differences found in the mean scores of difficulty and efficiency. A summary of the results is presented in Table 4-7.
Table 4-7: Descriptive statistics for perception of the learning activity in Study 2.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean a</td>
<td>SD</td>
<td>F</td>
<td>Sig.</td>
</tr>
<tr>
<td>I enjoyed this activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>3.47</td>
<td>1.073</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>4.11</td>
<td>.471</td>
<td>5.362</td>
<td>.027*</td>
</tr>
<tr>
<td>Total</td>
<td>3.78</td>
<td>.886</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I rather enjoy reading textbooks than learn with this kind of activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>2.95</td>
<td>1.026</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>2.83</td>
<td>1.295</td>
<td>.089</td>
<td>.768</td>
</tr>
<tr>
<td>Total</td>
<td>2.89</td>
<td>1.149</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The material was interesting for me to engage in the activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>3.74</td>
<td>.872</td>
<td>3.665</td>
<td>.064</td>
</tr>
<tr>
<td>Treatment</td>
<td>4.22</td>
<td>.647</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3.97</td>
<td>.799</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am more interested in Japanese medieval history after this activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>3.63</td>
<td>.955</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>3.78</td>
<td>1.003</td>
<td>.206</td>
<td>.653</td>
</tr>
<tr>
<td>Total</td>
<td>3.70</td>
<td>.968</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The activity was interesting for me to keep attention.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>3.58</td>
<td>1.071</td>
<td>4.501</td>
<td>.041*</td>
</tr>
<tr>
<td>Treatment</td>
<td>4.22</td>
<td>.732</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3.89</td>
<td>.966</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The way the information is arranged on the pages helped to keep my attention.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>3.42</td>
<td>1.121</td>
<td>1.405</td>
<td>.244</td>
</tr>
<tr>
<td>Treatment</td>
<td>3.83</td>
<td>.985</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3.62</td>
<td>1.063</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The difficulty level of this activity was appropriate for me</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>3.53</td>
<td>1.124</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>3.67</td>
<td>1.029</td>
<td>.156</td>
<td>.695</td>
</tr>
<tr>
<td>Total</td>
<td>3.59</td>
<td>1.066</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The material in the content was difficult to understand.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>3.16</td>
<td>1.167</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>2.94</td>
<td>.938</td>
<td>.373</td>
<td>.545</td>
</tr>
<tr>
<td>Total</td>
<td>3.05</td>
<td>1.053</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I learned something new through this activity.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>4.53</td>
<td>.612</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>4.61</td>
<td>.502</td>
<td>.211</td>
<td>.649</td>
</tr>
<tr>
<td>Total</td>
<td>4.57</td>
<td>.555</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel activities like this can improve my history study skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>4.05</td>
<td>.970</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>4.00</td>
<td>.686</td>
<td>.036</td>
<td>.851</td>
</tr>
<tr>
<td>Total</td>
<td>4.03</td>
<td>.833</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Minimum score =1; Maximum score =5
*significant at p<.05

Although several of these survey items yielded insignificant results, it should be noted that some of the scores were very high in both groups. For example, the scores for the questions regarding efficacy of the learning activity both exceeded 4.0. Students in both groups seemed to
consider the activity meaningful. As they were new to the material presented in the lesson, most students felt that they had gained new information. They also felt that this kind of inquiry learning was effective in improving their history study skills.

While these results show a crude map of the student perspectives on the lesson, it was still necessary to determine what these numbers did not show. To address this, student comments to the open-ended questions regarding positive and negative aspects of the lesson were analyzed. Although these comments are rather anecdotal and did not necessarily produce concrete evidence, they still helped to interpret the results, and especially to proceed with design modifications.

The comments identified several issues in terms of the research questions and design. First, there was an interesting difference between the control and treatment groups in terms of perceptions of the engaging element of the lesson. The control group students found the subject of the lesson engaging. For example:

“What I enjoyed most about this activity was the subject. It was something that was interesting to me. (P1A7).”

On the other hand, the treatment group students largely pointed to the interactive and game-like nature of the lesson. For example:

“It seems like a simulation game so that I could feel more comfortable while I was studying without though that actually I was studying. That is I could enjoy my time to study thanks to this new style of acquiring new knowledge (P1B9).”

This suggests that the treatment group students perceived the learning activity as more interactive than did the control students. The control group students who did not have the additional story elements felt that the subject of the lesson content helped them to become more engaged in the lesson. While both groups read the same documents, they seemed to take away a different experience from the activity (additional example comments are shown in Table 4-8).

Table 4-8: Student comments on the engaging element (Study 2).
Control:
“I definitely liked the topic. In fact because of this activity I will surely take a Japanese medieval history class as an elective now. In a story about Japan that is was reading it had references to the figures in this topic and now I understand that this story is the predating government of the one in the story that I read (P1A12).”
“That's good. I have gained more knowledge of Japanese history from this activity. I am interested in Japanese history. The timeline really help me to know the history (P1A17).”
“The content within this activity was very interesting to me. The information presented on the web page kept me interested and it was quite enjoyable especially to someone like me who has a strong liking for the Japanese culture and history (P1A18).”

Treatment:
“I thought that the activity was very tough in the sense that it made you think more then just reading and answering question. I liked how it kept me looking around the page for the answers rather then having the answers being given to me directly (P1B1).”
“I like how the activity was set up like a role playing situation. I am a gamer so I found it comfortable to work through it (P1B4).”
“I liked that it basically gave you main points as compared to text books where you have to sift through a lot of crap to get the main points (P1B6).”
“I liked how the learning process was interactive rather than just reading from a text book (P1B15).”

Second, differences of perception regarding the format were also noted between the control and treatment groups. The control group students found that the format as laid out in multiple documents offered helpful information. However, while some students considered the presentation of the lesson interesting, others considered it confusing.

“I also enjoyed the layout and the amount of information dispersed on each document. I found that the information was short and concise enough to keep my attention. (P1A7)”

“They were long enough to provide sufficient information but short enough so that I could get through it without losing attention. I also liked reading about the very different points of views regarding Kiyomori and the reason behind his actions (P1A2).”

On the other hand, while the treatment group students also perceived the presentation format as convenient, some students commented that the format was a “very distant feeling of reading the information from a textbook. This made it seem like I was part of the story (P1B12)”. Thus, the control group students might have perceived this aspect oppositely. A student in the control group commented as follows: “The activity basically felt like doing homework. The same thing
could pretty much be achieved with a textbook and a sheet of questions (P1A4); “Information is still presented in a boring "then this happened then this happened" textbook fashion. (P1A8).”

While students in both groups felt that the information provided was overwhelming and difficult to understand, the majority reflected that the experience as a whole was more positive than negative. Control group students reported feeling engaged in the reading activity, and treatment group students felt that the story-based environment provided a sense of interactivity. Students in the treatment group commented as follows:

“Everything was easy to find and read and it was definitely more interesting then a lecture class or reading out of a text book. (P1B8)”

“I like the format it organized information. It makes me pay more attention to the information I am looking for. (P1B11)”

The student comments also pointed to design problems of the learning environment. Several user-interface features were found to be inconvenient for students, who cited such drawbacks as confusing navigation tabs, vague guidance messages, and inconvenient page sequences:

“I don't like the way the flash lesson was arranged. The content is interesting but need more details of each period and more explanation so that I can have more accurate understanding (P1B2).”

“There was not enough interaction in the program to make me feel I was really a part of it and really playing the part of a detective to help a general that I never saw or spoke to. I feel I would have done better if I felt I was a part of the world (P1B8).”

“Also the whole mission style to the activity wasn't really finished. I read the info answered the questions but didn't really feel like I was done (P1B18).”

These claims were taken into consideration in the next design iteration phase.
Discussion

In summary, two different versions of an inquiry learning environment to teach medieval Japanese history (one with a story-based pedagogical agent “Sessai” and the other without) were designed and tested in Study 2. Results of the study are summarized below.

- No significant differences were observed in students’ content comprehension in the multiple-choice test and in their historical reasoning on the essay test.
- Students in the treatment group were significantly more positive about and interested in the learning activity than those in the control group.
- No significant differences were observed between the treatment and control groups in time spent on tasks and essay word counts.
- Students in the treatment group tended to express that the interactivity and game-like experience were engaging elements, while students in the control group felt the content itself was engaging.

The results of Study 2 were in line with previous studies on related themes, including seductive details and pedagogical agents (e.g. Choi & Clark, 2006; Moreno et al., 2001). While the treatment with pedagogical agents garnered more interest and attention from students, this did not necessarily influence their performances. The question is why, and if it is necessarily a bad thing. As previous studies argue that the addition of seductive details or pedagogical agents may be distracting, this lack of significance can still be interpreted positively because it can be considered an the indication of insignificant distraction. Therefore, the treatment does carry an advantage in gaining student interest. However, the new question is why the increase in enjoyment and interest did not improve student performance.

As the main difference between the control and treatment group was the story elements and the conversational message prompts, these elements may have helped to spark interest and
enjoyment. However, they did not seem to enhance learning. This may be explained by the notion of seductive details. As mentioned in Chapter 2, seductive details are interesting but extraneous materials that are not directly relevant to the learning goals in a multimedia instruction (Harp & Mayer, 1998).

The story elements and characters in the treatment condition can be considered seductive details. While seductive details have a positive influence on students’ interest, attention, and enjoyment (Park, 2005), this may not lead to an enhancement of learning performance (Garner et al., 1991; Harp & Mayer, 1997). However, seductive details are more likely to stimulate a personal response or holistic interpretation of the text (Schraw, 1997). If so, the treatment group in Study 2 seemed to fail to make use of such an influence. Even though the story elements in the treatment condition worked to engage students in the activity, it was likely that the students had difficulties performing their inquiry without instructional supports. The story elements did not contain such supports and the message prompts only provided clues to begin investigation for each document. Even if students received a clue of what to look for in the document, they may still have had difficulty in performing further investigations without understanding what they were supposed to do. Thus, it was decided that the next iteration should include such instructional supports in the treatment condition.

Therefore, there is the possibility that the intervention was not strong enough to cause an effect on learning performance. The instructional method embedded in the pedagogical agent incorporated simple, personalized message prompts, as shown in Table 4-9.

Table 4-9: Example of Sessai’s prompt in the lesson module for Study 2.

Sessai:
Do you need my help? OK.
First, look at the point where Kiyomori had faced challenges.
Second, who is the important person here? You should see it is the retired Emperor Go-Shirakawa.
So find out when he and Kiyomori’s relationship had changed.
Check the questions to see if there are some questions you can answer now.
Although this type of prompt may provide students with quick advice on where to look, the guidance is minimal and it does not offer any details on how to investigate the material or to answer the question. Therefore, it may be necessary to amplify the instructions embedded in the pedagogical agent to improve learning performance. The issue is what instructional elements should be implemented and how they should be applied in the treatment condition. The next section discusses this issue further, to clarify the main points for design modification.

**Design iteration 1: the birth of “Joe” the peer learner agent**

The pedagogical agent Sessai in Study 2 consisted of still images and message prompts. While the message prompts were used to deliver relevant information and guiding questions, no further support was provided. To improve learning performance, a reasonable approach was to enhance the instructional strategy embedded in the message prompts.

Prompting can be used for various purposes such as gaining attention, asking questions, providing clues to a solution, and explaining procedures. Previous studies have indicated that the use of question prompting helps students to focus on the problem and foster content comprehension (King, 1991). While the message prompts in Study 2 included some of these elements, they were not adequate enough to guide students into a deeper thinking process. As discussed in the previous sections above, some students reported that they were overwhelmed by the massive information. The student essays mainly contained one-sided arguments that did not consider the possibility of other perspectives, which may be an indication of the difficulty the students faced during the learning activity.

According to Collins *et al* (1990), modeling can be an effective teaching method to help students understand the cognitive processes required to perform a task. Take for example an
expert who performs a demonstration so that students can observe and understand the process of problem solving. Providing domain heuristics and question prompts are two methods by which to implement modeling activities in the learning environment (Smith & Reiser, 2005). As discussed in Chapter 2, domain heuristics have been identified in expert-novice studies (Wineburg, 1991). Historians’ heuristics include sourcing, contextualization, and corroboration. These heuristics may be used for modeling during the inquiry. Therefore, including such heuristics and coordinating question and message prompts became the focus of the design iteration for Study 3.

As the prompts were delivered by the pedagogical agent in the story-based environment, the modeling methods still needed to be incorporated with those elements. It was posited that adding a peer learner agent to enrich interactions with the agents would be a possible solution because of the following two reasons. First, pedagogical agents enhance learners’ empathy through the simulated social interaction that these characters provide (Ebbers, 2007; Kim et al., 2007). As empathy is considered an element to engage students in deeper inquiry (Davis et al., 2001; Foster, 1999; Lévesque, 2008), enhancing the interactions with agents may foster student empathy with regards to a given problem context.

Second, the use of a peer learner agent will make it possible to simulate different social interactions in the learning environment, such as peer-mentor interactions. Although many studies have been conducted on pedagogical agents, most of them studied the effect of a single peer learner agent and emphasized the effects of the different roles and characteristics of that agent. In a multiple agent environment, it is possible to embed multiple layers of interaction among the agents and the student. For example, students can learn by observing the peer agent’s reaction to the mentor agent, as well as learn by answering the mentor agent’s questions. In this way, embedding such interactions may have a notable influence on learning performance.
Design modifications

Therefore, the design iteration for Study 3 focused on embedding peer learning elements in the interactions of pedagogical agents in order to provide students with further support for inquiry. The following actions were taken for the design modification:

Addition of a peer learning element

To realize the notion discussed above, a new character, “Joe”, was added as a peer learner agent (Figure 4-4).

Figure 4-4: The peer agent added in Study 3.
While the mentor agent Sessai worked as a help-giver who has more knowledge than the student, Joe worked as a peer who primarily gives help, but sometimes seeks help from the learner in order to facilitate different types of social interaction (see Table 4-10 for the role description).

Table 4-10: Example of agent prompts in the lesson module for Study 3.

<table>
<thead>
<tr>
<th>Role</th>
<th>Sessai (Mentor agent)</th>
<th>Joe (Peer learner agent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Mentor as a help giver and a subject-matter expert</td>
<td>- Provides a mission and explains the learning context</td>
<td>- Peer as a help-seeker / help-giver</td>
</tr>
<tr>
<td>- Provides learner with a learn-by-observing opportunity by interacting with peer agent</td>
<td>- Provides learner with a learn-by-observing opportunity by interacting with peer agent</td>
<td>- Provides good/bad examples</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Provides review questions to help digest content</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Provides thought-provoking questions to facilitate higher-order thinking</td>
</tr>
</tbody>
</table>

Instead of fixing Joe’s role in a single state as other peer learner agent studies did, Joe’s dialogue scripts were arranged to interact with Sessai and the learner in various ways by offering different types of messages. For example, Joe’s messages contain typical errors often made by novice learners, such as becoming overwhelmed by large amounts of information, making biased comments, and drawing conclusions based on superficial understandings, as discussed in Chapter 2. Such statements were scripted by referring to the students essay answers and comments in Study 2. Joe’s messages also contain thought-provoking questions and general guidance to navigate students, as described in the next section below. Through the interactions with Sessai and Joe, students are encouraged to reflect on their original ideas to see if they can examine the problem deeper using historical thinking and reasoning skills.
Instructional supports embedded in the agents

Instructions were embedded as dialogue between the agents, and interactions were arranged with the agents so that the learner could practice document investigation and interpretation. Several methods to support the students’ inquiry process were used.

Teaching expert heuristics. Guidance, examples, and exercises to teach expert heuristics such as sourcing, contextualization, and corroboration, were included in the interaction mediated by the agents. When students first look at a document, Sessai explains the attributions of the document. He then throws a question to Joe in terms of how to investigate the document. Table 4-11 contains one such question.

Table 4-11: Example of the dialogue between the peer learner and mentor agent.

<table>
<thead>
<tr>
<th>Scripts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sessai: Now, I shall give you a quick exercise: Which of the following is the best inference for the Tales of the Heike as a historical source? Hey Joe, you answer this. 1. As the tale is written as a song-tale, the facts in the tale may have been altered or exaggerated, the facts have to be examined by referring other sources 2. The tale is reliable because it was written not so long after the historical events occurred 3. The tale is somewhat reliable because the author seems to describe the historical events from an impartial standpoint</td>
</tr>
<tr>
<td>Joe: Yes, master. Let see... I think &quot;2. The tale is reliable because it was written not so long after the historical events occurred&quot; is the answer.</td>
</tr>
<tr>
<td>Sessai: Incorrect. You cannot count on historical materials like that. Can you trust it just because it is old? You need to study harder. OK, your turn. What do you think?</td>
</tr>
</tbody>
</table>

The question reveals the points to consider in terms of the document attribution. Joe’s answer contains a naïve inference of the source. The mentor agent comments on his answer and asks the student to think about the question. The dialogue prompts students to think about the source of the document when considering their argument.

Joe’s reaction also contains an example of heuristics (see Figure 4-5).
In this example, Joe investigates a document and finds contradicting information in another document. He reacts confusedly and suggests referring to the timeline in order to make sense of the information within the historical context. He also provides a clue when stating why he is confused. His reaction includes an act of contextualization, which is a part of expert heuristics to be taught as additional instructional support for inquiry.

*Peer-evaluation exercise:* In a peer learning context, students can learn through various types of interaction including questioning each other, observing other’s performance, and comparing each other’s ideas. Evaluation of peer performance can be considered a part of such activity. By examining how others address the same question they are facing, they may have a chance to reflect on their tentative answer and think further based on the example. Thus, it was
posited that an additional peer-evaluation exercise would help students to take their argument further.

Such an exercise was implemented in the dialogues between the agents. When students start this exercise, Sessai asks Joe the question first and Joe answers the question. Joe’s answer is a type of worked example that contains shallow interpretations and unsupported arguments (see Table 4-12).

Table 4-12: Dialogue script for the evaluation exercise.

<table>
<thead>
<tr>
<th>Scripts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sessai: All right, next question. Joe, what could Kiyomori have done to prevent his hardship?</td>
</tr>
<tr>
<td>Joe: Well... That's a tough one. I don't know how to answer that... Let's say, “Kiyomori’s problem was his greediness and his opposition to the emperor and the Buddhist monks. That is why he was punished by the Judge of the Dead. He needed to be friendly with the retired emperor. Kiyomori should not have made any enemies related to the emperor. He should have just helped them.” How about that?</td>
</tr>
<tr>
<td>Sessai: No. That is far from a good argument. It seems you need more training, and to train harder.</td>
</tr>
</tbody>
</table>

By looking at Joe’s answer to Sessai’s question, students can see the problems in his answer. After Joe is finished, Sessai instructs the student on points to reconsider and how to improve upon his answer by giving a quiz (Table 4-13).

Table 4-13: Dialogue script for the evaluation exercise.

<table>
<thead>
<tr>
<th>Scripts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sessai: Okay, I want to hear your thoughts. How would you advise Joe to improve his argument?</td>
</tr>
<tr>
<td>1. You should consider why Kiyomori could not be friendly with the retired emperor. There is some information found in the document to support this.</td>
</tr>
<tr>
<td>2. You should recall that he was described as a nice person in one of the documents.</td>
</tr>
<tr>
<td>3. You missed the fact that Kiyomori was friendly to the retired emperor. They were just trapped by the aristocrats.</td>
</tr>
<tr>
<td>Sessai: (feedback for 1) Right. You made my point here. Just claiming without evidence will not make a good argument in history. For example, the Judge of the Dead is a fictional character. You should not confuse fiction and history like that. It seems that you got that idea. Also, if you don't have enough information to be conclusive, it’s a good idea to state that limitation in your account.</td>
</tr>
</tbody>
</table>
Sessai: (feedback for 2) That is Okay, but not good enough. It is true that he was described as a nice person but it could be misleading if you only say that. If you want to raise that point, you should also ask why such a nice person had to make enemies and drive himself into a bad situation. Go back and try again.

Sessai: (feedback for 3) No, that is quite misleading. You have no evidence to claim that they were trapped by the aristocrats. If you have some, you may be able to make a reasonable argument about that, but do you? Again, a wild speculation will not make your argument great. You should always find proof to support your argument. Go back and try again.

The following is a typical interaction between the agents and the learner. When the learner looks at a timeline of relevant historical events, the mentor agent tells the learner where to focus, what is happening, and how to contextualize the events. The mentor also questions Joe, the peer learner agent. When he answers incorrectly, the mentor gives him feedback to correct his misconception. In this way, the learner not only learns from his interaction with the mentor but also from the interaction between the agents. The design modification featuring such additional modeling was expected to help learners digest information and to ultimately improve their learning performance.

**Difference of the conditions**

The design modifications of the new iteration increased the lesson content and widened the difference in the amount of information between the control and treatment conditions. Table 4-14 shows the difference between the conditions, including the word counts of the content of Studies 2 and 3. While the difference was about 500 words in Study 2, students in the treatment group were required to read more than twice the amount than students in the control group for Study 3.

<table>
<thead>
<tr>
<th>Study 2</th>
<th>Study 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Treatment</td>
</tr>
<tr>
<td>Participant recruitment</td>
<td>Undergraduate Japanese courses (with $10 compensation)</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------------------------------------------------</td>
</tr>
<tr>
<td>Treatment condition</td>
<td>Inquiry without additional stories or agents</td>
</tr>
<tr>
<td></td>
<td>Story-based instruction with mentor learner agent</td>
</tr>
<tr>
<td></td>
<td>Same as Study 2</td>
</tr>
<tr>
<td></td>
<td>Story-based instruction with mentor &amp; peer learner agents</td>
</tr>
<tr>
<td>Embedded instructions</td>
<td>Message prompts for guidance to find clues for answer</td>
</tr>
<tr>
<td></td>
<td>Same message prompts as control in conversation style</td>
</tr>
<tr>
<td></td>
<td>Message prompts for general guidance</td>
</tr>
<tr>
<td></td>
<td>Guidance for document investigation</td>
</tr>
<tr>
<td></td>
<td>Question prompts</td>
</tr>
<tr>
<td></td>
<td>Dialogue between agents</td>
</tr>
<tr>
<td>Total amount of text (words)</td>
<td>1702</td>
</tr>
</tbody>
</table>

**Study 3: Does the addition of peer learning elements make a difference?**

**Introduction**

In December 2008, Study 3 was conducted as a posttest only experiment using a mixed data collection approach. The main purpose of Study 3 was to determine the influence of the modified version of the story-based pedagogical agents in an inquiry learning environment by comparing two prototypes (control group and treatment group) in different conditions. The treatment group was designed with story-based pedagogical agents, and the control group was designed without any agent elements. As described in the previous section, a peer learner agent was added to the treatment and the storyline was modified to embed this addition in the learning context. For the control condition, the message prompts were simplified and content-relevant guidance was excluded to clarify the difference between the control and treatment conditions. The message prompts contained only general guidance such as “Read through the document and find clues to answer the question”.

The researcher hypothesized that the peer learning element in the treatment condition would impact learning performance in the essay writing task, as well as student perspectives of the learning activity. As Schraw claimed that seductive details elicit personal responses and holistic interpretations and do not generally promote content comprehension of main ideas (Schraw, 1997), it was expected to see no significant differences in the content comprehension task. However, the probable increase in holistic interpretations recorded in the essays was expected to yield valuable data.

**Procedure**

The same research procedure taken in Study 2 was taken in Study 3. Both the control and treatment groups also used the same instructional materials from Study 2. Aforementioned design modifications were made, and additional features to reflect peer learning elements were added to the treatment condition. The measurement materials used to measure learning performance on content comprehension, historical thinking in essay writing, and student perspective on the learning activity in Study 2 were revised to fix minor expression issues.

Thirty-six participants were recruited from an introductory Japanese language course (those classes which were not recruited during the last pilot test were chosen for this recruitment cycle). Again, each participant was randomly assigned to either the control or treatment group and was seated at a computer. Informed consent was obtained from each participant before starting the session. The participants were asked to log in to the University’s Course Management System to begin the lesson activity. The participants were offered $10 as compensation for finishing all of the required activities.
After careful review of the data, one participant in the treatment group was eliminated from the data set for failing to complete a number of required tasks. Therefore, data from 35 participants were used for the data analysis.

Figure 4-6: Overview of the procedure of Study 3.

**Data analysis**

*Learning performance*

Table 4-15 shows the mean scores of the comprehension test, time on overall task, and essay word counts for each group. Again, the results of one-way ANOVA indicated no significant difference between the two conditions on all of these dependent variables. While students in the treatment group conducted a lesson with twice the amount of text than those in the control group, they did not spend as much time as students in the control group. This result can be interpreted positively or negatively. On the one hand, the additional content in the treatment group did not distract students or lower their performance. On the other hand, the additional elements did not
engage students as hoped, since greater engagement in an activity often logically results in spending more time on it. However, this result does not support that.

Table 4-15: Descriptive statistics for the learning performance in Study 3.

<table>
<thead>
<tr>
<th></th>
<th>Comprehension Test</th>
<th>Time on tasks</th>
<th>Essay word count</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>F</td>
</tr>
<tr>
<td>Control (n=17)</td>
<td>10.12</td>
<td>2.891</td>
<td>.392</td>
</tr>
<tr>
<td>Treatment (n=18)</td>
<td>10.67</td>
<td>2.275</td>
<td>.079</td>
</tr>
<tr>
<td>Total (n=35)</td>
<td>10.40</td>
<td>2.569</td>
<td>.001</td>
</tr>
</tbody>
</table>

Qualitative analysis of essay writing

Thirty-five participants answered the question in Table 4-16. Again, the student essays were analyzed with a microanalysis approach, using the same procedure as in Study 2.

Table 4-16: Essay questions for Study 3.

Q. If you are asked your expert opinion by a warlord (or a politician)* who wants to learn from Kiyomori's history to make his political career better, what would you suggest him? First, state the problem Kiyomori had, and then make your argument to resolve (or prevent from) the problem.

*Note: The character named “Imagawa Yoshiimoto” was used in the treatment condition.

The codes Problem (act / situation) and Perspective (one-sided / multiple perspective) generated in Study 2 were examined. A Fisher’s exact test on the frequency analysis indicated that the distributions of the problem and perspective categories were significantly different between the control and treatment groups (see Table 4-17).

Table 4-17: Frequency table of code categories in Study 3.

<table>
<thead>
<tr>
<th></th>
<th>Problem</th>
<th>Perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Situation (%)</td>
<td>Act (%)</td>
</tr>
<tr>
<td>Control (n=17)</td>
<td>7 (41.2)</td>
<td>10 (58.8)</td>
</tr>
</tbody>
</table>
The results of the control group were almost the same as in Study 2, which implies consistency. The most notable result of this analysis was that most of the students in the treatment group attributed Kiyomori’s problem not just to his actions or behavior, but to multiple perspectives, while the control group did not indicate such a tendency. It can be concluded that the treatment condition may have had an effect on students’ thinking process during the learning activity. This is addressed further in the discussion section.

**Student perceptions of the learning activity**

Student perceptions of the learning activity were measured by the self-report questionnaire. The results showed a significant difference in enjoyment (F (1, 34) = 6.561, p< .05) and interest in the activity (F (1, 34) = 5.888 p< .05). Although there was an indication of a possible difference in attention for the activity, it was not statistically significant. There were no significant differences found in the scores of difficulty and efficiency. A summary of the results is presented in Table 4-18.

<table>
<thead>
<tr>
<th>Enjoyment</th>
<th>Mean a.</th>
<th>SD</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I enjoyed this activity.</td>
<td>Control</td>
<td>3.65</td>
<td>.931</td>
<td>6.561</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>4.28</td>
<td>.461</td>
<td>.015*</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.97</td>
<td>.785</td>
<td></td>
</tr>
<tr>
<td>I rather enjoy reading textbooks than learn with this kind of activity</td>
<td>Control</td>
<td>2.47</td>
<td>1.068</td>
<td>.694</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>2.83</td>
<td>1.465</td>
<td>.411</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2.66</td>
<td>1.282</td>
<td></td>
</tr>
<tr>
<td>The material was interesting for me to engage in the activity</td>
<td>Control</td>
<td>3.65</td>
<td>.931</td>
<td>5.888</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>4.28</td>
<td>.575</td>
<td>.021*</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.97</td>
<td>.822</td>
<td></td>
</tr>
</tbody>
</table>
While the trends of student perceptions of the learning activity were mostly the same in Studies 2 and 3, some interesting themes were found by analyzing the students’ feedback comments. As the categories and examples were already introduced in the result section of Study 2, this section gives a summary of the major results.

**Engaging activity vs. simplicity**

A number of students in the treatment group commented on the engagingness of the activity because of its game-like interactivity.

“Learning in this way seems to make the history more relevant, especially since the user's task was to figure out how to prevent the same mistakes from being
made. I liked how this is like an adventure game version of a database question (DBQ)” from an AP history test. (P2B6)”

“I really, really enjoyed this learning experience. I felt as if I were playing a video game instead of reading a textbook. I actually smiled when I saw the format, since I’m a huge gamer. I almost felt as if I were in a roleplaying game, and I was actually there. Since I already enjoy Japanese history, I found this to be a great experience. Very good job. (P2B14)”

Similar comments were hardly given by students in the control group because such elements were not included. On the other hand, students in the control group commented that they liked the simplicity of the presentation format. The control group was shown the introduction along with each document on separate, distinct pages, which might have reminded them of a traditional textbook format. Their comments below indicated that this layout of information contained in short documents helped them to see the problem context in a different way.

“I liked that there were different pages to the activity and that on each page there was not too much text which helped me to better focus on the material. (P2A3)”

“I enjoyed the multiple documents available for me to analyze and the different point of views they offered. I also enjoyed how the lesson was arranged and organized and the pop-up screens that offered information and context clues. (P2A4)”

“I like that the passages were short. It helped my attention span last longer. I liked how the the information was set up. I have a hard time with textbooks because it is hard for me to process the information when it is that closely put together. (P2A9)”

**How students perceived support from the agents**

Some students in the treatment group described how the interaction with the pedagogical agents was helpful for the learning activity. The following comments reflect such student perceptions:

“The navigation was more than adequate, and the help from Sessai had an effect on my re-readings of the texts. (P2B6)”
“The asking Joe questions before the user responds. His answer and reasoning, and the response of his master provided me with a better understanding of the material and how I should be looking at it. (P2B9)”

“The navigation was more than adequate, and the help from Sessai had an effect on my re-readings of the texts. (P2B6)”

“It was fun that I had Sessai helping me out, or some of the long readings were a little bit too much. All the information were sorted carefully and neat, it was easy to go back and find the information you needed. (P2B18)”

“The asking Joe questions before the user responds. His answer and reasoning, and the response of his master provided me with a better understanding of the material and how I should be looking at it. (P2B9)”

“I liked the interactive part with Joe as the guide and having different people at the different places showing the different aspects of Kiyomori’s life. (P2B16)”

These comments indicate that the agents helped the students gain a better understanding of how to investigate the materials while still allowing them to enjoy the activity.

**Discussion**

The results of Study 3 indicated a similar trend to Study 2, with the exception of the significant difference in student essay writing. In the essay, students explained the different aspects of the context by contextualizing the information they found in the activity. The detailed analysis of the essay content uncovered various differences between the treatment and control groups.

**Neutral tone**

Students in the control group tended to focus on Kiyomori’s tyrannical behavior, and their tone was often accusative or critical when describing Kiyomori’s situation. Table 4-19 provides excerpts that demonstrate this tone.
Table 4-19: Control group essay responses.

“After Kiyomori gained power in the government he moved too quickly to change things. He made the current Emperor leave his throne to his son and imprisoned the Retired Emperor. These actions could be taken to be very brash and dishonorable as he was a soldier and as such seen as a lower class. Also because he tried to establish himself as an aristocrat he alienated himself from more and more people. He tried to change his image to be something that he wasn't. (P2A1) “

“The problem that Kiyomori has is that he wants to have too much power which cause him to do many crucial action to his people. A good leader is whom can listen to his people listen to not only the agreement but also whom can listen to the opposition. Killing people who do not support him does not mean he has all the power. Instead killing them would put him in a dangerous position. It is not possible for all the people to support one leader. He cannot simply kill those people in order to make sure his authority is stable. He attacks the temple which will only bring more hospitality towards him…. (P2A15)”

These essays primarily place blame on Kiyomori for his problems, a perspective that was presented in one of the documents the students investigated. Clearly, they did not take any of the other perspectives presented in the other documents into consideration. This suggests that they were likely to be biased negatively by one document and did not look further into the problem context to present an unbiased account. Such an inclination takes the form of a theoretical notion regarding novice-expert differences. History researchers (Rouet et al., 1997) who have studied differences in historical essays written by novice students and expert historians found that novice students tend to express clear-cut opinions with less contextual information while experts tend to offer contextual statements that include various types of contextual information.

On the other hand, the students in the treatment group used evidence to prove what drove Kiyomori to take such drastic actions. The tone of their arguments tended to be neutral or empathetic instead of accusative or critical. Table 4-20 presents examples.

Table 4-20: Treatment group essay responses.

“He became an enemy and had a lot of hard times with him becoming an enemy to some of the places he took over and people in his family began to die. The people began to not trust Kiyomori and became hostile towards his clan. His son had died and the emperor had confiscated his land. The people saw that Kiyomori was losing control and couldn't control what was happening. (P2B2)”
“Firstly Kiyomori had a relationship with the retired Emperor Go-Shirakawa through the marriage of Kiyomori's daughter and Emperor Takakura (this is assuming the retired emperor was related to the new emperor by blood). He also became chief minister. Because of Kiyomori's relationship this caused a problem when both his son and daughter died and resulted in the retired Emperor Go-Shirakawa to begin to seize and confiscate things. This caused a dilemma for Kiyomori because of the things the retired Emperor did and how he was related to Kiyomori.

While there were several directions in which to take a situational argument, students in the treatment group used political and economical reasons to argue Kiyomori’s situation. Although there were students in the control group who made such arguments, the number was significantly less than that of the treatment group.

**Multiple perspectives**

As described above, the treatment group students tended to consider the larger picture of Kiyomori’s situation by considering his political and economical circumstances. On the other hand, the control group students who did not make such arguments were likely to focus on the narrow picture in terms of Kiyomori’s military actions, making one-sided arguments (see Table 4-21).

Table 4-21: Example of a one-sided argument.

“I think Kiyomori is a great man who was able to maintain his empire during his life time. But by looking at his clan were defeated by Minamoto after the several years he died we can clearly see he is pretty weak on organization on the future. However he was described as a vicious cruel dictator in the Tale of Heike. It shows that he was hate by many people even though he was described as a very nice person in one of the document. (P2A12)”

“There are different opinions on Kiyomori both positive and negative. However Kiyomori seems to be nice only to those who obey him. He is cruel when he is facing his enemies. For example he personally might not be against buddhism but because those buddhist monks hide the Retired Emperor's decree instead of hand him over he became mad and unrespectful to the Buddhist Law. (P2A13)”
While the task was to figure out why Kiyomori was described as a bad figure regardless of his accomplishments, these students tended to draw simple causal relationships and failed to take other perspectives into consideration. Even when they took Kiyomori’s positive characteristics into consideration, their arguments were often the “He did a good thing, but…” type of restricted argument.

*Instructional support to help students think further*

Although students in both groups read the same materials, treatment group students tended to use the evidence in the document regarding Kiyomori’s political and economical situations. This difference can be attributed to the instructional support provided to the treatment group through the agents’ dialogue (Table 4-22).

<table>
<thead>
<tr>
<th>Table 4-22: The dialogue between the peer learner and mentor agents.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scripts</strong></td>
</tr>
<tr>
<td>Sessai:</td>
</tr>
<tr>
<td>Joe:</td>
</tr>
<tr>
<td>Sessai:</td>
</tr>
</tbody>
</table>

In this dialogue, Sessai encourages students to contextualize the document in the timeline and throws a question to Joe. Joe offers his thoughts based on his investigation. He concludes that Kiyomori’s situation was unfortunate because he had to take such a drastic approach. Sessai tells him that his conclusion is not good enough and encourages him to rethink it.
Such dialogue between the agents was intended to provoke students to think deeper and encourage them to reflect upon their reasoning. It was considered that a simple read through the document might not be sufficient for students to grasp how the information in the document could be interpreted and applied. According to Perry (1970), college students move toward a mature cognitive understanding from a naïve position. Starting from this naïve position, students tend to think dichotomously. In other words, they first tend to use simple causal reasoning, concluding that something is either good or bad, right or wrong. They also tend to dismiss contradictions and connect what they want to believe. In such a case, this dialogue provided them the additional instructional support intended to help them understand how they could think further about the issue.

Students who are able to acquire such a relative view tend not to easily criticize or accuse, just because one source says they should. If they find evidence to the contrary, they try to understand the reason behind the contradiction (Perry, 1970). Even though the support may have been minimal, the result indicated that the treatment condition seemed to help students to surpass their normal level of reasoning, allowing them to produce situational arguments in a more mature manner.

In summary, the following three indications were the major results of Study 3:

1. Compared to students in the control group, students in the treatment group enjoyed the activity more and found it more interesting. They also reported that it held their attention (although there were insignificant differences in other indicators of student perception).

2. While there was no significant difference in the results of the content comprehension test, significantly more students in the treatment group presented situational arguments that included multiple perspectives in the essay writing task. Students in
the control condition tended to attribute Kiyomori’s problem to his personal acts, giving less consideration to situational information.

(3) Students in the treatment group included contradicting information to make their argument in a more neutral tone, whereas a number of students in the control group failed to include such information and tended to make their arguments from a one-sided perspective and in an accusing tone. Student comments from the treatment group indicated that they thought the interactions among the agents helped them to investigate the materials further than they would have without such support.

**Design iteration 2: adding more interaction with the agents**

In Study 3, students in the treatment condition showed a noticeable change in perspective by presenting situational arguments. Based on the self-report questionnaire and feedback comments on the learning activity, the story elements and interactions with the pedagogical agents seemed to contribute to this result.

The second phase of the design iteration focused on enhancing the current peer learning elements, and evaluating the impact on a different audience. The following design modifications were made in this phase:

*Peer-evaluation exercise:* In Study 4, a more elaborate peer-evaluation exercise was implemented after this activity in Study 3. At the end of the inquiry activity, Sessai asks students to evaluate Joe’s report, which is a response to the same essay question that the students are going to answer. As students are required to comment on Joe’s example before writing their own answers, they get an opportunity to reflect on someone else’s reasoning by looking at their peer’s work. This example uses more advanced historical reasoning to explain Kiyomori’s situation (Table 4-23).
Table 4-23: Dialogue script for the evaluation exercise.

<table>
<thead>
<tr>
<th>Scripts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sessai:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>(on the essay question page) Joe wrote his report to Sessai as follows:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&quot;Kiyomori’s problem was that he became an enemy and had a lot of hard times handling some of the places he took over. Also, people in his family began to die. The people began to distrust Kiyomori and became hostile towards his clan. His son had died and the emperor had confiscated his land. The people saw that Kiyomori was losing control and couldn't control what was happening. I would advise my lord to be trustworthy and make sure that people like him keep a tight control and take command of bad situations and don't become vulnerable.”</td>
</tr>
</tbody>
</table>

Please evaluate his answer from a historian’s viewpoint. Is his argument good or bad? Should he make any changes? What would you suggest that he do differently?

As the example makes a situational argument by taking multiple perspectives concerning political and economical circumstances, it encourages the students to reflect upon their own reasoning process. In finding a good point from Joe’s report, they can learn from it and improve upon their own arguments. Similarly, when they find points to improve upon in Joe’s report, they can take these into consideration as well.

_Explicit explanation of heuristics._ The second feature included in the design was an explanation of expert heuristics used in historical inquiry, such as sourcing, contextualization, and corroboration, which were explained in Chapter 2. Although these heuristics were indirectly referred to without explicitly naming them in the treatment groups for Studies 2 and 3, Sessai instructs students how to use these heuristics in Study 4 by explicitly explaining the terms. This type of instruction was purposely included to gauge its effect on student arguments, as such explicitness is a recommended heuristic of researchers (Hynd-Shanahan et al., 2004; Martin et al., 2008). The only difference between this instruction on heuristics and the instruction given in Study 3 was that the name of the heuristic was not specified as it was in Study 3. A dialogue script example is presented in Table 4-24.
Table 4-24: An example of dialogue script explicitly explaining expert heuristics

<table>
<thead>
<tr>
<th>Scripts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sessai: You have to examine the facts in the document by comparing it with the other documents before you can verify its reliability. This method is called &quot;corroboration.&quot; You may think this is a tricky question, but it isn't. Keep in mind that a historical source does not always tell you the whole truth.</td>
</tr>
</tbody>
</table>

**Study 4: Does the additional interaction cause a more positive influence?**

**Introduction**

With the modified version of the learning environment, Study 4 was conducted as a posttest only experiment using a mixed data collection approach at the Pennsylvania State University in April 2009. The main goal of Study 4 was to investigate the influence of the modified version of the story-based pedagogical agents in an inquiry learning environment by comparing three different conditions (control, comparable, and treatment). The control group was designed in the condition without a story-based pedagogical agent. The same lesson module used for Studies 2 and 3 was used for the control condition of Study 4.

While following the same materials and research procedures in Studies 2 and 3, a comparable group without peer learning elements was used to examine whether the dialogue between the agents influences the learning context and thus provides better support, or whether the same information can be presented by a single agent. The comparable group excluded the peer learner agent Joe and all the peer learning elements. The guidance that Joe formerly imparted was not removed. The mentor agent Sessai was left to deliver these messages to the group. The treatment group was an enhanced version of the treatment group in Study 3, with the addition of a
After these modifications, the amount of information included in the lesson module exceeded that of the Study 3 treatment condition. The students in the treatment group would therefore have to read more than twice the amount of text than those in the control group. The word count of the comparable group was less than that of the treatment group, mainly due to the exclusion of the peer learning elements.

Another major change was the recruitment of research participants from a different audience pool. This recruitment took place at a general education course, whereas the participants for Studies 2 and 3 were recruited at Japanese language courses. The change was made to see if the intervention would have the same impact on a more general audience. As the subject of the
content was Japanese history, the participants in Study 2 and 3 might have had more interest in
the subject than students in general.

The results of Study 3 showed that the addition of peer learning elements had an impact
on students’ interpretations and explanations in the essay writing task. Other indicators such as
content comprehension and student perception regarding enjoyment, interest, attention, difficulty,
and efficacy did not differ between Studies 2 and 3. The design changes made in the second
iteration phase focused on enhancing peer learning elements to guide students toward further
observational learning. Thus, the researcher hypothesized the changes in the peer learning
element in the treatment condition to have a positive impact on student essay writing. The
positive effects previously observed on student interest, attention, and enjoyment were expected
to remain.

Procedure

The same procedure used in Studies 2 and 3 was used in Study 4, the only difference
being that Study 4 participants were randomly assigned to three groups. The same instructional
materials from Study 3 were used in Study 4, and the design modifications as described in the
previous section were implemented. Measurement tools used to measure learning performance on
content comprehension, historical thinking in essay writing, and student perspective on the
learning activity were used. The essay writing task was revised to add a peer-evaluation exercise
question and a question that asked for the factors to consider when investigating historical sources
(Table 4-26). The latter question was added to encourage students to reflect upon the activity and
to explain their notions of historical inquiry. Their responses were expected to show whether the
explicit explanations of the domain heuristics provided had any impact on their reasoning process.
Table 4-26: Essay questions for Study 4.

(Control)
Q1. If you are asked your expert opinion by a warlord (or a politician) who wants to learn from Kiyomori's history to make his political career better, what would you suggest him? First, state the problem Kiyomori had, and then make your argument to resolve (or prevent from) the problem.

(Comparable)
Q1. If you are asked your expert opinion by Imagawa Yoshimoto, who wants to learn from Kiyomori's history to make his political career better, what would you suggest to him? First, state the problem Kiyomori had, and the reason why he was described as a villain. Then, make your best argument about how to resolve (or prevent) the problem. Please elaborate as much as possible in a logical manner.

(Treatment)
Please answer the following essay questions. Feel free to review the lesson content while answering these questions.
Q1. Joe wrote his report to Sessai as follows: “Kiyomori’s problem was that he became an enemy and had a lot of hard times handling some of the places he took over. Also, people in his family began to die. The people began to distrust Kiyomori and became hostile towards his clan. His son had died and the emperor had confiscated his land. The people saw that Kiyomori was losing control and couldn't control what was happening. I would advise my lord to be trustworthy and make sure that people like him keep a tight control and take command of bad situations and don't become vulnerable.”
Please evaluate his answer from a historian’s viewpoint. Is his argument good or bad? Should he make any changes? What would you suggest that he do differently?
Q2. Same as the Q1 for the comparable group above.

Seventy-eight undergraduate students were recruited at a general education course pertaining to earth and mineral science. The participants were offered extra credit points for the course grade as compensation for finishing all of the required activities. After careful review of the data, three participants were eliminated from the data set for failing to complete a number of required tasks and/or showing obvious indifference to the tasks (answering 1 for all questions and finishing in a few minutes). The data from 75 participants were used for the data analysis.
Participants (n=75) Assigned randomly

Control (n=26) Lesson

Comparable (n=26) Lesson

Treatment (n=23) Lesson Evaluation exercise

Multiple-choice test answers Essay Answer

Perceptions on the learning activity

Post survey

Figure 4-7: Overview of the procedure of Study 4.

Data analysis

Learning performance

Table 4-27 shows the mean scores of the comprehension test, time on overall task, and essay word counts for each group. The results of one-way ANOVA indicated no significant difference on comprehension test and time on tasks. The results of the essay word count did indicate a significant difference between the groups (p<.01).

Table 4-27: Descriptive statistics for the learning performance in Study 4.

<table>
<thead>
<tr>
<th></th>
<th>Comprehension Test</th>
<th>Time on tasks</th>
<th>Essay word count</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>F</td>
</tr>
<tr>
<td>Control (N=26)</td>
<td>8.08</td>
<td>3.045</td>
<td></td>
</tr>
<tr>
<td>Comparable (N=26)</td>
<td>8.04</td>
<td>2.537</td>
<td>0.043</td>
</tr>
<tr>
<td>Treatment (N=23)</td>
<td>8.26</td>
<td>2.864</td>
<td></td>
</tr>
<tr>
<td>Total (N=75)</td>
<td>8.12</td>
<td>2.785</td>
<td></td>
</tr>
</tbody>
</table>
The result showed that the comparable group spent less time and wrote less during the essay task than did the treatment group. This may have been due to the additional evaluation exercise task, which asked students to suggest how Joe could improve his argument. As the treatment group students spent more time on tasks than the comparable group students, it was likely that the additional task required students to devote more time towards the essay writing.

**Qualitative analysis of essay writing**

A qualitative microanalysis was conducted that followed the same procedure as in Studies 2 and 3. The codes Problem (act / situation) and Perspective (one-sided / multiple perspective) generated in Study 2 were examined (Table 4-28). A frequency analysis of these codes indicated that the distributions of the problem category ($\chi^2 (2, N=75) = 14.612, p<.001$) and those of the perspective category ($\chi^2 (2, N=75) = 6.801, p<.05$) were significantly different within the three groups. A frequency analysis between the two groups revealed that the comparable group was significantly higher than the control and treatment groups in Problem category, and significantly higher than the control group in Perspective category, while no significant difference was found between the control and treatment groups.

Table 4-28: Frequency table of code categories in Study 4.
Chi-squared tests between two groups

<table>
<thead>
<tr>
<th></th>
<th>Problem</th>
<th>Perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\chi^2$</td>
<td>Sig.</td>
</tr>
<tr>
<td>Control and comparable</td>
<td>14.016</td>
<td>.000**</td>
</tr>
<tr>
<td>Control and treatment</td>
<td>2.683</td>
<td>.101</td>
</tr>
<tr>
<td>Comparable and treatment</td>
<td>4.740</td>
<td>.029*</td>
</tr>
</tbody>
</table>

* significant at $p<.05$  
**significant at $p<.001$

The results followed the same trend from Study 3 in terms of the significant difference between the control and comparable groups. This means that more students in the comparable group made situational arguments using multiple perspectives than those in the control group. However, no significant difference was found between the control and treatment groups.

The most possible cause of this result may be that the instructions for the additional evaluation exercise did not work as expected due to the lack of instructional support. On the last part of the lesson activity, students in the treatment group were asked to evaluate Joe’s essay, which answered the same question that the students were about to answer. As mentioned earlier, students were asked to evaluate two types of essay answers given by Joe (see Table 4-29). The first exercise was to evaluate the novice-level answer that contained such mistakes as biased judgment, mistaken fiction and historical fact, and opinionated naïve conclusion without rationale. The second exercise was to evaluate the answer by incorporating situational arguments that use multiple perspectives to explain Kiyomori’s situation.

Table 4-29: Joe’s responses as presented in the evaluation exercise.
First answer
“Kiyomori’s problem was his greediness and his opposition to the emperor and the Buddhist monks. That is why he was punished by the Judge of the Dead. He needed to be friendly with the retired emperor. Kiyomori should not have made any enemies related to the emperor. He should have just helped them.”

Second answer
“Kiyomori’s problem was that he became an enemy and had a lot of hard times handling some of the places he took over. Also, people in his family began to die. The people began to distrust Kiyomori and became hostile towards his clan. His son had died and the emperor had confiscated his land. The people saw that Kiyomori was losing control and couldn’t control what was happening. I would advise my lord to be trustworthy and make sure that people like him keep a tight control and take command of bad situations and don't become vulnerable.”

While students were guided by the mentor agent's instructions on how to evaluate the answer in the first exercise, the second exercise did not offer any guidance. Without guidance, it was likely that the students just evaluated the answer at their current level of understanding.

Students evaluated Joe’s answer as good, relatively good, or bad based on different reasons.

Although there was no indication that the evaluation exercise helped students to make their argument, the students may have been confused by the exercise. See Table 4-30 for an example.

Table 4-30: Student response to Joe's argument.

A1 (response to Joe’s answer).
“His argument is okay but I think it is important to look at why a lot of these things were occurring. I think some of the claims that Joe has are very good but it is also necessary to know why these claims happened… (snip)… I would suggest to Joe that instead of being so vague he explain some of these claims in more detail to give the reader some more information that would better help them to understand the answer…” (P4C13)

A2 (answer for the essay question).
“The problem that Kiyomori had was that he had some bad relationships with some very important people. For example apparently he had a bad relationship with the previous emperor. That right there is a bad start. The people of Japan most likely had trust in their previous emperor and now it is only reasonable that they begin to lose trust in Kiyomori because of his relationship with the other emperor. Also it is important to take care of the people of the lands that you take over…” (P4C13)

This student appeared to make his argument without using Joe’s claims. As Joe’s character was portrayed as a less knowledgeable person in the story given that his answer in the
first exercise was rejected by Sessai, it was possible that students assumed Joe’s answer contained some mistakes. In such a case, the students might have felt that they were supposed to write something different than Joe.

Table 4-31 gives an example of how Joe’s answer may have misled the students.

Table 4-31: Student response to Joe's argument.

A1. “I think that he makes a fairly good argument. It is true that will all of the negative things that have happened in his life there will be times when he is lead down the wrong path. However he missed the fact that in some of the documents Kiyomori was described as a nice person one who took care of things when necessary along with helping people with financial problems. Another document also said that he was a caring individual.”

A2. “Kiyomori was described as a villain because of the bad things he did. Yes he made some poor judgments but in the end he was a good guy. He invested in different things for people while also being a good citizen and someone who always helped out. This problem could be prevented if everyone was able to overlook the few mistakes he made to see that a majority of his life he was a great person.” (P4C2)

This student identified a missing point in Joe’s claim and continued to argue that point. He focused only on Kiyomori’s character and failed to include other critical points such as Kiyomori’s political and economical situations.

Several students did comment critically on Joe’s feedback, although they failed to deliver what they claimed (Table 4-32).

Table 4-32: Student responses to Joe's argument.
They argued only about Kiyomori’s violent acts, although they reviewed Joe’s answer containing multiple perspectives. It was possible that they might have been less interested in the activity and made a hasty conclusion just to finish the assignment, or they might have been overwhelmed by the information and needed more explicit instructional support.

These cases indicate that just letting students review and evaluate other’s work may not necessarily lead them in a positive direction. Although the first exercise provided a mentor’s support to evaluate Joe’s answer, it clearly did not work for the students. It can be concluded that the additional evaluation exercise negatively impacted several students, who appeared to need further instructional support to complete the exercise successfully.

Student perceptions of the learning activity

Following the same procedure from Studies 2 and 3, student perceptions of the learning activity were measured by the self-report questionnaire. The results showed that there was a significant difference in interest (F (1, 34) = 6.832 p< .01) for the activity. There were no
significant differences found in terms of other variables. A summary of the results is presented in Table 4-33.

Table 4-33: Descriptive statistics for perception of the learning activity in Study 4.

<table>
<thead>
<tr>
<th></th>
<th>Mean a.</th>
<th>SD</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Enjoyment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I enjoyed this activity.</td>
<td>Control</td>
<td>3.00</td>
<td>1.095</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>3.50</td>
<td>1.030</td>
<td>2.631</td>
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<tr>
<td></td>
<td>Treatment2</td>
<td>3.57</td>
<td>.662</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.35</td>
<td>.979</td>
<td></td>
</tr>
<tr>
<td>I rather enjoy reading textbooks than learn with this kind of activity</td>
<td>Control</td>
<td>2.42</td>
<td>1.238</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>2.73</td>
<td>1.282</td>
<td>.685</td>
</tr>
<tr>
<td></td>
<td>Treatment2</td>
<td>2.35</td>
<td>1.152</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2.51</td>
<td>1.223</td>
<td></td>
</tr>
<tr>
<td><strong>Interest</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The material was interesting for me to engage in the activity</td>
<td>Control</td>
<td>3.00</td>
<td>.980</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>3.77</td>
<td>.587</td>
<td>6.382</td>
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<tr>
<td></td>
<td>Treatment2</td>
<td>3.65</td>
<td>.885</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.47</td>
<td>.890</td>
<td></td>
</tr>
<tr>
<td>I am more interested in Japanese medieval history after this activity</td>
<td>Control</td>
<td>3.04</td>
<td>1.216</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>3.46</td>
<td>1.174</td>
<td>1.087</td>
</tr>
<tr>
<td></td>
<td>Treatment2</td>
<td>3.43</td>
<td>1.037</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.31</td>
<td>1.150</td>
<td></td>
</tr>
<tr>
<td><strong>Attention</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The activity was interesting for me to keep attention.</td>
<td>Control</td>
<td>3.27</td>
<td>1.185</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>3.69</td>
<td>1.087</td>
<td>1.107</td>
</tr>
<tr>
<td></td>
<td>Treatment2</td>
<td>3.61</td>
<td>.941</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.52</td>
<td>1.083</td>
<td></td>
</tr>
<tr>
<td>The way the information is arranged on the pages helped to keep my attention.</td>
<td>Control</td>
<td>3.00</td>
<td>1.296</td>
<td></td>
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<tr>
<td></td>
<td>Treatment</td>
<td>3.50</td>
<td>.906</td>
<td>2.528</td>
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<tr>
<td></td>
<td>Treatment2</td>
<td>3.70</td>
<td>1.146</td>
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<td></td>
<td>Total</td>
<td>3.39</td>
<td>1.150</td>
<td></td>
</tr>
<tr>
<td><strong>Difficulty</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The difficulty level of this activity was appropriate for me</td>
<td>Control</td>
<td>3.23</td>
<td>1.107</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>3.12</td>
<td>.909</td>
<td>.475</td>
</tr>
<tr>
<td></td>
<td>Treatment2</td>
<td>3.39</td>
<td>.941</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.24</td>
<td>.984</td>
<td></td>
</tr>
<tr>
<td>The material in the content was difficult to understand.</td>
<td>Control</td>
<td>3.31</td>
<td>1.011</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>3.65</td>
<td>1.129</td>
<td>1.270</td>
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<tr>
<td></td>
<td>Treatment2</td>
<td>3.78</td>
<td>1.126</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.57</td>
<td>1.093</td>
<td></td>
</tr>
<tr>
<td><strong>Efficacy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I learned something new through this activity.</td>
<td>Control</td>
<td>4.08</td>
<td>.977</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>4.42</td>
<td>.578</td>
<td>1.282</td>
</tr>
<tr>
<td></td>
<td>Treatment2</td>
<td>4.30</td>
<td>.765</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>4.27</td>
<td>.794</td>
<td></td>
</tr>
</tbody>
</table>
The results were similar to those of Study 3. The treatment condition succeeded in capturing student interest, although there was not a statistically significant difference in terms of enjoyment and attention. Student comments on the learning activity also showed the same pattern from Study 3. Examples of such comments are as follows:

“IT's nice to have a change in the way you learn instead of the old lecture and book methods. It allowed me to forget about learning a little bit as well since it put you into that time in history and was interactive. (P4B7)”

“I liked that it was set up in a first person slide. The fact that they are talking to you and telling you things makes it more interesting to retain information rather than just reading facts off a page. (P4B18)”

“The interactivity like a story being like you are a part of the culture and are learning with a purpose. It was fun and I feel like I learned more. I would have retained nothing if I read it out of a book. (P4B21)”

“The set-up of this activity was very appropriate for an online class for Japanese history. I have taken several online classes and one of them had this kind of structure where you had to click to keep advancing and answer questions correctly to move on. I like that type of strategy. (P4C13)”

As these comments indicate, a number of students in the comparable and treatment groups found it engaging because of the interactivity and game-like nature of the activity. As this study was conducted in a school context, students tended to find this activity more engaging when compared to their daily schoolwork.

In summary, the findings of Study 4 were as follows:

(1) Similar to Studies 2 and 3, there were no significant differences in the comprehension test and time on tasks between the groups. The essay word counts showed that the comparable group students wrote significantly less in their essays than the treatment
group students. This may be because the comparable condition did not have an additional evaluation exercise.

(2) A qualitative analysis of the essay writing indicated that significantly more students in the comparable group delivered situational arguments using multiple perspectives than did students in the control group, while the treatment group largely failed to produce such arguments. It should be noted that patterns of interference from the additional evaluation exercise were detected.

(3) There was a significant difference in student interest between the control and treatment groups. However, this increased interest did not necessarily reflect upon student performance. These trends were already found in the previous studies, and no new findings appeared in terms of student perceptions of the lesson activity in Study 4.
Chapter 5

Conclusion

Summary of findings: what can we see from the results of these studies?

To clarify the findings of the studies, the differences between the treatment and control conditions are summarized:

(1) The use of story-based pedagogical agents differentiated each study. While the same storyline to provide contextual information was used, Study 2 featured the mentor-type pedagogical agent Sessai, who appeared as a character in the story and instructed learners by way of message prompts. As the same guidance and question message prompts were used for the control and treatment groups, the actual difference between the control and treatment groups was the story elements and the conversation-style message prompts. In Study 3, a peer learner agent was added to enhance the social aspect of learning in the treatment condition. Further instructional support that provided domain heuristics and practice opportunities for students in terms of document investigation and interpretation were embedded in the interactions between the mentor and peer agents. In Study 4, an additional evaluation exercise and explicit instruction of domain heuristics were added to the treatment group to enhance the peer learning element. To examine whether the peer learning elements had an impact, a comparable group was added by removing all peer learning features.

(2) The required amount of reading in each study varied as a result of these differences. Compared with the control condition in Studies 3 and 4, more than double the amount of text was provided in the treatment condition in Study 3 and the comparable and treatment conditions in Study 4.
Given these differences, we can now discuss results for each of the research questions.

(a) Does the use of different scaffolding strategies embedded in story-based pedagogical agents have an impact on learners’ content comprehension in a web-based historical inquiry learning environment?

There were no significant differences in content comprehension between the control and treatment conditions throughout the studies. There are two possible interpretations for this result. First, it may be an indication that the use of story-based pedagogical agents may not have had a strong effect on content comprehension in the inquiry learning environment. The test measured students’ comprehension of the content through factual knowledge questions and questions that measured conceptual understanding. A previous study on seductive details indicated that additional elements such as story or character may not necessarily work for comprehension of the main idea of the text, but may instead stimulate personal responses and holistic interpretations of the text (Schraw, 1997). This result supported Schraw’s finding. On the other hand are claims that seductive details such as story and pedagogical agents may potentially interfere with learning. Although this research did not identify an indication of improvement, there was no significant indication of interference either.

Second, it was possible that the interventions were too short to affect comprehension. It should also be noted that the studies compared different designs of an inquiry self-learning environment. Although it may have been possible to observe effects after comparing against other control conditions, such as instruction by way of a single textbook reading or teacher-mediated instruction, such comparisons were out of the scope of this research.

(b) Does the use of different scaffolding strategies embedded in story-based pedagogical agents influence the learners’ historical reasoning as measured in an essay writing task?

There were no differences in Study 2. However, Study 3 showed significantly more students in the treatment group making situational arguments using multiple perspectives than the
control group. The addition of instructional supports for modeling were presented in examples, domain heuristics, and practice opportunities provided by the agents, intended to aid students in performing the essay writing task on a deeper level. The students in the control group were likely to attribute Kiyomori’s actions to the cause of his problem and tended to have a one-sided perspective. Most of those in the treatment group took multiple perspectives into consideration and argued the situational aspects of Kiyomori’s problem.

In Study 4, the addition of an evaluation exercise in the treatment condition did not work as expected. No significant difference was found in the treatment condition, and the comparative condition worked better than the other conditions. This might have been caused by the additional evaluation exercise, which may have interfered with learning in the treatment condition and/or the lack of instructional support in the additional exercise.

(c) Does the use of different scaffolding strategies embedded in story-based pedagogical agents have an impact on learners’ perceptions of the learning activity in terms of enjoyment, interest, attention, difficulty, and efficacy?

Positive impacts were observed in terms of student enjoyment, interest, and attention. Students in the treatment groups experienced more interest and enjoyment in the learning activity than those in the control groups. The activity also held their attention better. This result was consistent throughout the studies. There was a significant difference observed in student perception of what elements made them think the lesson was engaging. Students in the treatment group found the lesson’s interactivity and game-like nature to be the most engaging. As the same lesson materials were used for both conditions, this may be an indication that the story-based pedagogical agents had enhanced the engagingness of the learning activity.

Overall, this research partially replicated previous pedagogical agent studies by other researchers. Although it indicated no significant difference in content comprehension, positive influences were found in subjective perceptions of enjoyment, interest, and attention. A notable
finding of this research was that the use of story-based pedagogical agents impacted students’ methods of interpreting historical sources and making arguments, which was observed in the essay writing task.

Throughout the design iterations, the treatment condition included more instructional supports for modeling as well as additional peer learning elements. The design elements of the pedagogical agents used in this research consisted of fictional characters that appeared in the story offering conversational guidance and question prompts. They provided students with examples, domain heuristics, and opportunities to practice historical reasoning. Although it was inconclusive whether the impact on the student essays can be attributed to the peer learning elements embedded in the agents (due to the design failure of the additional evaluation exercise in Study 4), the results suggested that the story elements should be incorporated with the necessary instructional design considerations in order to foster learning performance while sustaining student interest in the activity.

**Limitations**

Certain limitations became evident due to several constraints faced by the researcher. First, as the design of the lesson module was still in the prototyping phase, the fact that the design was incomplete may have affected the result. For example, the evaluation exercise added in the treatment condition of Study 4 did not work as expected due to the inadequacy of the instructions. Therefore, further study is required to discuss the usefulness of the approach taken in the research. Second, the studies were designed as posttest only experiments. While most students did not have prior knowledge of the lesson subject, their capacity for historical reasoning prior to the study was unknown. It was not controlled more than the random assignment of the participants.
Third, since the length of the treatment was short and students were exposed to the treatment only once, it is possible that novel effects had an influence on student performance. Additional studies that assign students to more lessons would be helpful to understand the effect of the design approach taken in this research.

Finally, limitations arose due to the modifications needed during the research process. During the iteration process, the researcher realized that various lesson modules and measurement tools could have been modified to produce better results. For example, lesson materials could have been added to provide students with a richer learning context. Measurement tools crafted by the researcher also could have been modified based on the findings from the previous experiments. However, such issues were not initially evident when design decisions were made during the iteration process and only became apparent following deeper reflection during the later phase of the research. As the lesson content and measurement tools were modified minimally to sustain the continuity of the studies, several imperfections in the materials were left unmodified.

Implications of the research

The results of this research indicated several findings. Study 2 indicated that the story elements and mediation of the pedagogical agent did not have an impact on learning performance, although they succeeded in gaining the interest and enjoyment of learners. While the result of Study 2 was mostly a replication of previous studies claiming that pedagogical agents can increase learners’ interest and attention, the study demonstrated that such an effect can be produced without using audio narrations or animation.

This result raised the question of what elements make effective pedagogical agents and why we need them. As discussed in Chapter 2, there have been academic debates over the necessity of pedagogical agents (Clarebout & Elen, 2007; Clark & Choi, 2007; Veletsianos, 2008).
However, it may not be so meaningful to argue whether pedagogical agents are necessary or not, because necessity and usefulness largely depend on the problem context that the agents are going to be used toward, as well as their design quality. Previous studies indicate that adding seductive elements to the learning content may increase learners’ interest and enjoyment (Garner et al., 1991). Study 2 showed that while such elements may not cause interference, they may not be adequate enough to improve learning performance either.

In Study 3, additional instructional support was added to enhance learning performance by providing examples, domain heuristics, and practice opportunities in the interactions with the mentor and peer learner agents. The modification provided more information in the form of more elaborate message prompts in the treatment condition. As a result, while the impact on student enjoyment, interest, and attention held steady, significantly more students delivered situational arguments using multiple perspectives than did those in the control condition. Although inconclusive, the effects should be attributed to the additional instructional support more than to the addition of peer learning elements, while the increase in student interest and enjoyment may be attributed to the story and agent elements.

To examine whether the positive influence can be attributed to the peer learning elements derived from Study 3, the comparable condition without the peer learning elements was added in Study 4. Furthermore, an additional evaluation exercise was embedded in the treatment condition in the mentor and peer learner agent interactions. The treatment condition did not result in a better performance than that of the comparable condition, as patterns of interference cropped up in the additional evaluation exercise. These may have been caused by the lack of instructional support offered during the exercise. The result indicated that if the instructions embedded in the treatment condition did not suit the skill level of the students, they may not have worked as effectively as expected.
The results suggested that it is necessary to embed adequate instructional supports in the design of pedagogical agents to positively influence learning performances. Even if the agent is nicely designed as a likable agent, this positive influence may be limited to a moderate gain in interest and attention.

For the continuation of this research, there are several directions to explore. First, to understand further the influence of the peer learning element, another round of experiments with different conditions may be a reasonable approach. As Study 4 indicated that the additional evaluation exercise for the treatment condition needs to include further instructional support to help those students who tend to be distracted by biased information, iterating the evaluation exercise section and examining how it helps students may be the immediate next step.

Second, even though the current results indicated that the treatments did not have a significant influence on content comprehension, this does not mean this type of approach will never work. While this research focused on the design of instructional support for historical reasoning, the design of instructional support for content comprehension has not yet fully explored. If content comprehension is to be the research focus, the lesson module should include instructional support for the learning objective. For example, the learning task must be oriented for content comprehension by adding more practice opportunities to examine the specific knowledge during the activity. The role of the agents should also be adjusted to the learning objective. Since the peer learner agent may compete with students in a comprehension quiz type of exercise, feedback from a mentor agent will have more impact on content comprehension positively. While it can be posited that such a treatment condition may have a significant influence on content comprehension, further research is required to explore such a notion.
Implications for instructional design

Designing an effective inquiry learning environment is challenging and requires iterative efforts, even if one takes into consideration all available design guidelines and principles. This research demonstrated that only applying story elements or pedagogical agents to the design of an inquiry learning environment did not improve learning performance, despite the fact that students liked the design. It was also indicated that embedding well-designed instructions into pedagogical agents is crucial to improving learning performance. After finding that the initial design of the story elements and pedagogical agents were not an adequate intervention, the implementation of additional instructional support was found to be the solution to achieving the design goal of this research.

While studies on pedagogical agents are becoming more technology-focused, researchers may need to consider what instructional support the pedagogical agents will deliver without relying on technological features. While the design of visual complexities such as detailed gestures and facial expressions are expensive and often irrelevant to the learning context and tasks, story elements can be arranged to make the agents more relevant to the learning context and tasks quite effectively and relatively inexpensively.

To step further in the direction this research has headed, evaluating the influence of story elements that deliver different kind of instructional support may be an interesting direction to take. In Study 4, an agent that made use of modeling helped students to make a situational argument using multiple perspectives. Although the approach taken in this research called for the addition of a peer learning agent, it still may be possible that story elements offering guidance by way of directed observation can have a positive outcome. For example, the mentor agent could assign students an evaluation exercise without the appearance of a peer learner agent by stating the following; “I received a report from my assistant, but it’s terrible. Will you review it and tell me
what’s wrong with it?” The agent could then give feedback during the review process. In such a case, a peer learner agent would not be necessary. Rather, a peer learner agent could help to deliver step-by-step feedback to students through scaffolding dialogue with other agents, as it is difficult to provide such dialogue through a single agent.

It is also important to consider how this type of design approach for inquiry learning can be applied to an actual curriculum. The initial notion of the researcher was to use this type of lesson module as a supplemental learning activity, such as a homework assignment. If a short lesson module can teach students quick tips to improve their performance in an inquiry learning context, it should be a helpful tool for teachers to conduct inquiry in their classrooms.

While this research focused on the design of a computer-based lesson module for a self-learning setting, it may be the case that a computer-based environment is not an option. Even in such a case, there is still a way to make use of the design approach taken in this research. Applying the story elements to a classroom activity by adapting them to a role-playing activity may be an alternative approach to creating an inquiry learning environment without using computers. Students can take on roles that include different roles such as historian who investigate, mentor who support the historian, peer learner who cooperate with the historian, and other characters assigned to deliver important information during the course of the activity. Students share the same story as a learning context, and understand what their missions are from the story. Teacher may take the role of mentor and provide the instructional support for modeling and feedback comments to facilitate the activity. Although it is certainly a whole new research agenda, this is another interesting approach to explore.

As a final note, the indications of this research may be useful for designers who use seductive elements to engage students, such as story-based instruction and educational games. While seductive elements were added to gain student attention and interest, they did not necessarily support learning. Students also need instructional supports to accommodate these
elements when tackling specific learning goals. Therefore, it is important to incorporate scaffolds that promote learning objectives as well as entertaining elements.

Although the design approach of story-based pedagogical agents as taken by this research needs further refinement to provide an ideal design framework, the researcher hopes that this work will initiate a new direction for researchers interested in the design of pedagogical agents for inquiry learning in history education.
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Appendix A

Scripts for the lesson introduction

(Treatment group)

It is 1555, close to the end of the Muromachi period (1334-1573), a time known as the age of warfare. Provincial warlords fight against each other to expand their territory. There lives a warlord in Suruga province by the name of Imagawa Yoshimoto. He is held in awe by the other warlords and is considered one of the strongest warlords in the country. His Chief General, Taigen Sessai is known as a great strategist in both political and military affairs. He is also a Buddhist monk who has regarded Yoshimoto as his mentor since he was young.

You are an assistant to Chief General Sessai. He has requested that you conduct some research for him. Click Next to visit Sessai when you are ready.

Sessai: Oh, there you are. Look, I have a special request for you. My lord told me that he had a strange dream last night. A demon flew down to his bed and left this picture scroll. It was a dream, but the scroll is real. Strange, isn't it? Besides, I have never seen this type of drawing technique before.

Anyway, this seems to be a picture depicting Taira no Kiyomori (平 清盛) dying of fever. It looks like the Judge of the Dead is punishing him. Maybe this was drawn based on the epic poem Heike Monogatari, also called the Tale of the Heike (平家物語, composed in the 13th century).

Sessai: Taira no Kiyomori was the leader of the Taira clan in the late Heian period (794-1191). Through Kiyomori's strong leadership, the Taira clan gained positions of higher ranks and titles in the court. In 1167, Kiyomori became the first courtier of a warrior clan to be appointed Dajo Daijin, chief minister of the government, a position which offered much power. However, the prosperity of the Taira clan did not last long. Kiyomori died from illness in 1181, worrying about the future of his clan. His sons and grandsons were defeated after his death by the Minamoto clan, who eventually started the first military government known as the Kamakura Bakufu in 1192.

Sessai: Despite his achievements, Kiyomori was described as a vicious, cruel dictator in the Tale of the Heike. Do you have any idea why Kiyomori was described like this? There must have been something going on. This incident tells us something. As you know, we Imagawa clan are one of the strongest in the nation, and my lord aims to dominate the entire country. As a first step, we will march into the capital city Kyoto to gain authorization from the Shogun. We will discuss our strategy of managing political power as well as military power.

Sessai: I don't want my lord to end up like Kiyomori, so I really want him to learn from Kiyomori's history. This is why I called you. Now, I want you to investigate Kiyomori's history and figure out what his problem was and why he was described as a villain. Report your findings to me. You have no time to waste. You should find some information in our archive and elsewhere. I will give you some guidance when you need it.
In the Heian period (794-1191), the imperial family and aristocrats held the political power in the capital of Japan. Aristocrats looked down upon warriors as uncultured boors, hardly worthy of respect, and denied them power.

In the late Heian period, the situation changed. Taira no Kiyomori (平清盛) was the leader of the Taira clan at the time. Through Kiyomori's strong leadership, the Taira clan gained positions of higher ranks and titles in the court. In 1167, Kiyomori became the first courtier of a warrior family to be appointed Daijō Daijin, chief minister of the government, who held the strongest administrative power in the imperial government. He also arranged a marriage between the Emperor and his daughter, which strengthened the Taira family's political power. However, the prosperity of the Taira clan did not last long. Kiyomori died from illness in 1181, worrying about the future of his clan. The Taira clan was completely defeated soon after his death by the Minamoto clan, who eventually started the Kamakura Bakufu, the first military government in 1192.

Despite his achievements, Kiyomori was described as a vicious, cruel dictator in the epic poem Heike Monogatari, which was also called the Tale of the Heike (平家物語, composed in 13th century). Here is a picture based on the tale. Kiyomori died following a painful fever. This picture depicts the Buddhist Judge of the Dead causing his suffering. Why was he described like this?

Your mission is to investigate Kiyomori's history and figure out why he was regarded as a villain, despite his accomplishments.

Click on the rest of the menu items and start investigating the documents.
Appendix B

Measurement instruments

Question prompts for the learning activity (Study 1)

1. At what point does Kiyomori bring about his own downfall? Why does he do this?
2. From the timeline, what can you tell about the relationship between Kiyomori and the retired Emperor Go-Shirakawa?
3. What was the intention of the letter?
4. Why did the Buddhist monks rage against Kiyomori?
5. What was the issue that Kiyomori faced?
6. What is Kiyomori's or the Taira family's weakness? Why?
7. How is Kiyomori's character described in the documents?
8. What differences do you find in Kiyomori's character between the documents?
9. Essay: Based on your findings, explain why Kiyomori was described as a villain, and why he chose to be disliked. Make sure to cite evidence from the documents to support your argument.
Pre-survey instrument (Study 1-4)

Q1. What is your gender?  
1. Male  
2. Female

Q2. What year are you?  
1. First-year  
2. Sophomore  
3. Junior  
4. Senior  
5. Other

Q3. Are you a history major student? (Or, are you going to major in history?)  
1. Yes  
2. No  
3. Not sure

Q4. Have you ever studied Japanese medieval history before?  
1. Yes  
2. No

Q5. Do you like to study history?  
1. Yes  
2. Somewhat yes  
3. Not sure  
4. Somewhat no  
5. No
Self-reported questionnaire (Study 2-4)

Please tell us your thoughts and impressions on this activity. Please be frank.

(Q1-10: Select from the following Likert Scale response categories:

Strongly agree  Somewhat agree  Neither  Somewhat disagree  Disagree;

Q11-12: Free answers)

1. I enjoyed this activity.

2. The difficulty level of this activity was appropriate for me.

3. I would rather learn from a textbook than take part in this kind of activity.

4. I learned something new through this activity.

5. The activity was interesting enough to keep my attention.

6. The way the information is arranged on the pages helped to keep my attention.

7. The material was difficult to understand.

8. The material helped me to feel engaged in the activity.

9. I am more interested in Japanese medieval history after completing this activity.

10. I feel activities like this can improve my history study skills.

11. What did you like about this activity?

12. What did you NOT like about this activity?
Comprehension test questions (Study 2-4)

Please close the lesson page before answering the following questions. (In Study 3, the following sentence was added here: Attempt to answer them WITHOUT LOOKING AT THE LESSON CONTENT.) As the purpose of this test is to evaluate the lesson content, not your knowledge, please don’t feel pressured. Your test score will NOT affect your course grade. Please complete all questions before continuing.

<table>
<thead>
<tr>
<th>Question</th>
<th>Option</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. When did Taira no Kiyomori lead the Taira clan?</td>
<td>A. In the late 10th century</td>
<td>Answer: C Kiyomori led the Taira clan during 1153-1181, so C is the most appropriate answer.</td>
</tr>
<tr>
<td></td>
<td>B. In the late 11th century</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C. In the late 12th century</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D. In the late 13th century</td>
<td></td>
</tr>
<tr>
<td>2. Which of the following describes Kiyomori most accurately?</td>
<td>A. He led the Taira clan and defeated the rival Minamoto clan, but his clan was defeated by them after his death</td>
<td>Answer: A A is the correct answer. B. He became the minister of the court, but did not establish his own military government. It was the Minamoto clan which established a military government in Kamakura in 1192. C. He was not assassinated. D. He sponsored the construction of other temples, but not the reconstruction of those that were burned down.</td>
</tr>
<tr>
<td></td>
<td>B. He was the first courtier to establish a military government separate from the imperial court in Kamakura</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C. He grabbed political power in the imperial court, but was assassinated by the outraged Buddhist monks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D. He sponsored the construction of a new Buddhist temple after burning down the old ones that opposed him</td>
<td></td>
</tr>
<tr>
<td>3. Which of the following was NOT what Kiyomori did to strengthen the Taira clan's political position?</td>
<td>A. Sponsored the construction of the Rengeo-in temple for the Retired Emperor Go-Shirakawa</td>
<td>Answer: C C is the answer. One of the documents indicated that the Taira clan did not keep good relationships with the local warriors.</td>
</tr>
<tr>
<td></td>
<td>B. Arranged a marriage between Emperor Takakura and his daughter Tokuko</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C. Kept good relationships with the local warriors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D. Funded a port for renovation to gain profit from international trade</td>
<td></td>
</tr>
<tr>
<td>4. Which of the following was most likely the purpose of Kiyomori's coup</td>
<td>A. His daughter's death weakened his political power; therefore, he had to act drastically to regain his power</td>
<td>Answer: A A is the correct answer. B. The Buddhist monks rebelled against Kiyomori because he conducted a coup</td>
</tr>
</tbody>
</table>
1. d'etat?
   - C. The Minamoto clan gained political power; therefore, he had to demonstrate his strength in the imperial court
   - D. The death of the Retired Emperor Go-Shirakawa made his situation difficult; therefore, he had to scare the rival aristocrats

2. d'etat?
   - C. The Minamoto clan never gained power in the imperial court while Kiyomori was alive
   - D. Kiyomori died before the Retired Emperor.

3. 5. Who was imprisoned when Kiyomori staged a coup d'etat?
   - A. Minamoto no Yoritomo
   - B. Prince Mochihito
   - C. The Retired Emperor Go-Shirakawa
   - D. Emperor Takakura
   
   Answer: C
   - The coup d'etat was conducted against the Retired Emperor Go-Shirakawa.

4. 6. Which of the following describes the consequence of Kiyomori’s coup d'état most accurately?
   - A. He was opposed by other warrior clans and had to give up some of his privileges
   - B. He regained his political power in the imperial court temporarily, but it brought him into a worse situation
   - C. He was supported by the Buddhist monks and was able to protect his clan’s privileges successfully
   - D. He failed to regain political power and established a new government on his own

   Answer: B
   - B is the correct description of the consequence.
   - A. Incorrect because Kiyomori succeeded the coup d'etat and gained political power at that moment
   - C. There is no evidence that Kiyomori was supported by the Buddhist monks
   - D. He gained political power in the imperial court. It is not correct to say he started a new government on his own.

5. 7. Which of the following describes Kiyomori's character most appropriately?
   - A. He was a greedy, cruel dictator with no mercy even for his close retainers
   - B. He dealt with his opponents severely but was humble and caring to those close to him
   - C. He opposed organized religion and disliked the Buddhist monks
   - D. He was a strong warrior leader but he had no interest in imperial court politics

   Answer: B
   - B is the correct answer.
   - A. This does support the description in one document, but does not support the evidence from the other document
   - C. Incorrect because Kiyomori was a Buddhist monk himself, and he supported the constructions of the Buddhist temples
   - D. The documents revealed that he was quite a politician.

6. 8. Which of the following constructions was NOT sponsored by Kiyomori?
   - A. Ohwada no Tomari (a port in Kobe) to gain profit from international trade
   - B. Itsukushima Shrine to dedicate to his household god
   - C. Rengeo-in temple to support the Retired Emperor Go-Shirakawa
   - D. Kofukuji temple to appease the outraged Buddhist monks

   Answer: D
   - A-C. These are mentioned in the documents.
   - D. There is no evidence that Kiyomori supported the construction of the Kofukuji temple or appeased the Buddhist monks.

7. 9 Which of the following
   - A. They were in good standing after the success of the earlier rebellions, but the
   - B. They were in good standing

   Answer: A
### 10. Which of the following best describes Kiyomori's reason for attacking the Buddhist monks?

- A. Kiyomori hated Buddhism and wanted to promote native Japanese deities
- B. The Buddhist monks held Prince Mochihito who called for taking up arms against Kiyomori
- C. The Retired Emperor Go-Shirakawa ordered him to attack the Buddhist monks
- D. Kiyomori found that the Buddhist monks were conspiring with the aristocrats to abduct Prince Mochihito

**Answer:** B

- A. Kiyomori was a Buddhist monk himself.
- B. The Retired Emperor did not order the attack.
- C. The Buddhist monks did not mention other warrior clans.

### 11. Which of the following best describes the Buddhist monks’ probable view of Kiyomori?

- A. We have to stop Kiyomori's usurpation of the imperial court and attack on Buddhism
- B. We are grateful to Kiyomori for sponsoring the construction of our temple, but we cannot stand his sons' usurpation of our privileges
- C. We are outraged not only by Kiyomori, but by all the warrior clans who brought chaos to the imperial court
- D. We should take advantage of the confusion Kiyomori caused and gain our privileges in the imperial court

**Answer:** A

- A. The statement can be supported by evidence in the document.
- B. There is no evidence showing that Kiyomori supported the construction of their temple.
- C. The Retired Emperor did not mention other warrior clans.

### 12. Which of the following is NOT the issue Kiyomori was facing when he decided to send warriors to the Buddhist temples?

- A. His clan was losing land due to the death of his daughter, which made it difficult for him to keep his political power
- B. His clan was facing financial difficulty because of the failure of the international trade with the Song Dynasty
- C. His clan was losing political power because the Retired Emperor Go-Shirakawa took his clan's privileges away
- D. His clan was facing increasing hostility and distrust from other political groups

**Answer:** B

- B. There was no evidence indicating financial difficulty due to the failure of the international trade.
- A.C.D. These were mentioned in the document.

### 13. What happened to Kiyomori after the burning down of the Buddhist

- A. The Judge of the Dead took Kiyomori’s life as punishment
- B. The Buddhist monks surrendered to Kiyomori and supported him to gain political power in the imperial court

**Answer:** D

- A. The judge of the Dead is obviously a fictional character.
- B-C. These are possible consequences, but are less
14. Which of the following is the best description of what happened after Kiyomori’s death?

A. The Retired Emperor Go-Shirakawa was assassinated by Kiyomori's outraged son
B. The Taira clan sustained its political power and eventually established the first military government in Kamakura
C. The Taira clan kept growing with the enormous profits from international trade with the Song Dynasty
D. The Taira clan did not last long and lost its political power soon after his death

Answer: D
A. Go-Shirakawa was not assassinated.
B. The Taira clan was destroyed by the Minamoto clan soon after his death.
C. There is no evidence to support this statement.

---

Evaluation exercise for the treatment group (Study 4)

Please answer the following essay question:

If you are asked your expert opinion by a warlord (or a politician) who wants to learn from Kiyomori's history to make his political career better, what would you suggest to him?

First, state the problem Kiyomori had, and the reason why he was described as a villain. Then, make your best argument about how to resolve (or prevent) the problem. Please elaborate as much as possible in a logical manner.

Joe wrote his report to Sessai as follows:

“Kiyomori’s problem was that he became an enemy and had a lot of hard times handling some of the places he took over. Also, people in his family began to die. The people began to distrust Kiyomori and became hostile towards his clan. His son had died and the emperor had confiscated his land. The people saw that Kiyomori was losing control and couldn't control what was happening. I would advise my lord to be trustworthy and make sure that people like him keep a tight control and take command of bad situations and don't become vulnerable.”

Please evaluate his answer from a historian’s viewpoint. Is his argument good or bad? Should he make any changes? What would you suggest that he do differently?

What do you think are important factors to consider when investigating historical sources? Why are they important?
Appendix C

Lesson materials

(Control group)

<table>
<thead>
<tr>
<th>Scene</th>
<th>Script</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intro</td>
<td>In the Heian period (794-1191), the imperial family and aristocrats held the political power in the capital of Japan. Aristocrats looked down upon warriors as uncultured boors, hardly worthy of respect, and denied them power. In the late Heian period, the situation changed. Taira no Kiyomori (平 清盛) was the leader of the Taira clan at the time. Through Kiyomori's strong leadership, the Taira clan gained positions of higher ranks and titles in the court. In 1167, Kiyomori became the first courtier of a warrior family to be appointed Daijō Dajin, chief minister of the government, who held the strongest administrative power in the imperial government. He also arranged a marriage between the Emperor and his daughter, which strengthened the Taira family's political power.</td>
</tr>
<tr>
<td>Intro 2</td>
<td>However, the prosperity of the Taira clan did not last long. Kiyomori died from illness in 1181, worrying about the future of his clan. The Taira clan was completely defeated soon after his death by the Minamoto clan, who eventually started the Kamakura Bakufu, the first military government in 1192. Despite his achievements, Kiyomori was described as a vicious, cruel dictator in the epic poem Heike Monogatari, which was also called the Tale of the Heike (平家物語, composed in 13th century). Here is a picture based on the tale. Kiyomori died following a painful fever. This picture depicts the Buddhist Judge of the Dead causing his suffering. Why was he described like this?</td>
</tr>
</tbody>
</table>

Intro 2 direction

Your mission is to investigate Kiyomori's history and figure out why he was regarded as a villain, despite his accomplishments.

Click on the rest of the menu items and start investigating the documents.

Note: Please go back to the ANGEL page and answer the rest of the survey questions before you move forward.

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Important events in Kiyomori's life</th>
</tr>
</thead>
<tbody>
<tr>
<td>1153</td>
<td>Kiyomori became head of the Taira clan after the death of his father.</td>
</tr>
<tr>
<td>1156</td>
<td>Won the Hōgen Rebellion, which established the rivalry with the Minamoto clan.</td>
</tr>
<tr>
<td>1159</td>
<td>Won the Heiji Rebellion, defeated the Minamoto clan, and killed Minamoto no Yoshitomo, the head of the clan. Exiled a few of Yoshitomo's sons.</td>
</tr>
<tr>
<td>1164</td>
<td>Completed the temple Rengeō-in under the order of the Retired Emperor Go-Shirakawa.</td>
</tr>
<tr>
<td></td>
<td>Kiyomori and his family dedicated a hand-copied Sūtra to Itsukushima Shrine. Construction of the shrine was funded by Kiyomori.</td>
</tr>
<tr>
<td>1167</td>
<td>Became the first courtier of a warrior family to be appointed chief minister of the government, Daijō Dajin.</td>
</tr>
<tr>
<td>1171</td>
<td>Emperor Takakura and his daughter Taira no Tokuko were married.</td>
</tr>
<tr>
<td>Year</td>
<td>Event</td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td>1177</td>
<td>Shishigatani Incident. The conspirators against the rule of Kiyomori were arrested and punished before any uprising could take place.</td>
</tr>
<tr>
<td>1179</td>
<td>Staged a coup d'état and imprisoned the retired Emperor Go-Shirakawa.</td>
</tr>
</tbody>
</table>
| 1180 | - Forced the Emperor Takakura to abdicate and give the throne to Takakura and Tokuko's son, Prince Tokuhito, who became the Emperor Antoku.  
- Prince Mochihito, who called for arms against Kiyomori, was defeated by Kiyomori at the Battle of Uji (the beginning of the Genpei War).  
- Minamoto no Yoritomo, son of Yoshitomo, rebelled against Kiyomori in Izu.  
- The military of the Taira clan was defeated by the Minamoto clan at the Battle of Fujigawa.  
- Taira no Shigehira and Tomomori, sons of Kiyomori, destroyed the temples in Nara to reduce the power of the warrior monks. |
| 1181 | Kiyomori died from illness. |
| 1183 | Battle of Kurikara, the Taira clan was defeated by the Minamoto clan and abandoned Kyoto to the south. |
| 1184 | Battle of Ichi-no-Tani, Taira clan was defeated by the Minamoto clan and lost many major officers of the clan. |
| 1185 | - Battle of Yashima, the Taira clan was defeated by the Minamoto clan and lost their power in the Shikoku area.  
- Battle of Dan-no-ura, the Taira clan was defeated and destroyed by the Minamoto clan. |

**Timeline**

Browse the timeline to find the information you need to answer the question.  
Feel free to check other documents and come back again if you want.

**Doc 1**

This is a letter sent by Buddhist monks requesting help to rebel against the Taira family.  
From the Onjoji to the Kofukuji temple affairs office:  
A request for assistance to prevent the destruction of this temple  
The great virtue of the Buddhist Law is that it guards the imperial authority: the imperial authority endures because of the Buddhist Law. Now, the Former Chancellor-Novice Taira no Kiyomori, known in religion as Jokai, has tyrannically usurped the powers of state, thrown the government into confusion, and caused resentment and sorrow both within and outside the court: and in consequence the second son of Retired Emperor Go-Shirakawa has suddenly come to our temple, arriving on the night of the Fifteenth of this month, in the hope of escaping an undreamed-of calamity. In what they call a Retired Emperor's decree, the Taira have demanded that we hand him over, but our soldier-monks are determined to keep him, and Kiyomori intends to send warriors into our temple. The Buddhist Law and the imperial authority are threatened with simultaneous destruction.  
When Wuzong of Tang tried to destroy Buddhism by force of arms long ago, the Wutaishan monks went into battle and frustrated him. That is what Buddhist monks did in the face of imperial authority. We can scarcely do less against a renegade like Kiyomori! Let the southern capital remember the unprecedented exile of a guiltless matter for mutual congratulation, and a deep satisfaction to us, if your soldier-monks will save fellow Buddhists from destruction and defeat the forces of evil. The foregoing transmits the agreement reached by our soldier-monks in general assembly.  
Eighteenth Day, Fifth Month, Fourth Year of jisho (1180) From All the Monks
different versions. The tale was performed by Biwa hōshi (lute priests) and was enjoyed as entertainment.

**Doc 2**

The following document describes the severe situation Kiyomori was facing. The anti-Taira conspiracy was given impetus by two personal misfortunes that befell Kiyomori in 1179. In the sixth month of that year, the daughter of Kiyomori, who had been so instrumental in her father's acquisition of the Fujiwara (powerful aristocrat family) lands, suddenly died. The Retired Emperor Go-Shirakawa used her death as a pretext for seizure of the "Fujiwara inheritance." Two months later Kiyomori's heir, Shigemori, also died; Echizen Province, which earlier had passed to Shigemori's son as a provincial proprietorship, was now confiscated by Go-Shirakawa. The vulnerability of the Taira's grip on events thus stood exposed, causing Kiyomori to make a fateful choice. He gathered troops in the eleventh month and proceeded to order the dismissal or demotion of all who had opposed him. Go-Shirakawa was placed under house arrest, and the newly vacated government posts were freely distributed to his own kinsmen. The Heishi leader now became master of Kyoto. (Mass, 1974, p20)

As Kiyomori ascended the imperial ladder in Kyoto, perceptions of the Taira began to change in the provinces. The more the Taira sought to model themselves as central aristocrats, the more they apparently engendered local hostility and distrust. ... The Taira had abandoned much of their provincial legacy but were finding it difficult to achieve parity with the long-established institutions of the capital. Their attention had been deflected from the provinces, but their development as central nobles was painful and slow. This anomalous condition would ultimately contribute to the Taira demise. (Mass, 1974, p.25)

**Doc 3**

The following document describes another side of Kiyomori. "Kiyomori was very humble and took care of everything appropriately. ... The Retired Emperor Go-shirakawa was longing for the completion of the Rengeō-in. Kiyomori sponsored the completion of its construction. (Source: Gukanshō, Vol.5)"

"Kiyomori took considerate care of his servants, even the lowest ones. A lowly servant was treated as an honorable man by Kiyomori in front of his family, and he was so honored and felt truly grateful."

"Kiyomori tried to take others light-heartedly and took in jest even those who did awful things."

"Kiyomori appreciated his people with a smile even when one made a terrible mistake." (Source: Jikkinsho 7-27)

Kiyomori funded and constructed Itsukushima shrine in the 12th century...

Kiyomori also funded the renovations of Ōwada no Tomari (a port currently known as the Port of Kobe) and made use of the port for international trade with the Song Dynasty in China. The wealth of the Heike clan was largely increased from the profit of the trade. (Source: The Tale of the Heike)
Jikkinsho (十訓抄) is a collection of anecdotes composed in 1252. The stories aimed to teach good morals to the youth. The author is unknown.

Ending

Your mission is to investigate Kiyomori's history and figure out why he was regarded as a villain, despite his accomplishments.
Make sure to investigate all of the documents.
When you finish investigating the documents, please complete the question on the ANGEL page.
Note: If you submitted your answer, please go to the "posttest" section and “post survey” section, and answer the questions there.

(Treatment group)

<table>
<thead>
<tr>
<th>Scene</th>
<th>Script</th>
</tr>
</thead>
</table>
| Intro | It is 1555, close to the end of the Muromachi period (1334-1573), a time known as the age of warfare. Provincial warlords fight against each other to expand their territory. There lives a warlord in Suruga province by the name of Imagawa Yoshimoto. He is held in awe by the other warlords and is considered one of the strongest warlords in the country. His Chief General, Taigen Sessai is known as a great strategist in both political and military affairs. He is also a Buddhist monk who has regarded Yoshimoto as his mentor since he was young. You are an assistant to Chief General Sessai. He has requested that you conduct some research for him. Click Next to visit Sessai when you are ready.
STOP: Please go back to the ANGEL page and answer the rest of the survey questions. When you finish, return here and click the Next button to continue. |
| Mission | Sessai: Oh, there you are. Look, I have a special request for you. My lord told me that he had a strange dream last night. A demon flew down to his bed and left this picture scroll. It was a dream, but the scroll is real. Strange, isn't it? Besides, I have never seen this type of drawing technique before.
Anyway, this seems to be a picture depicting Taira no Kiyomori (平 清盛) dying of fever. It looks like the Judge of the Dead is punishing him. Maybe this was drawn based on the epic poem Heike Monogatari, also called the Tale of the Heike (平家物語, composed in the 13th century).
Sessai: Taira no Kiyomori was the leader of the Taira clan in the late Heian period (794-1191). Through Kiyomori's strong leadership, the Taira clan gained positions of higher ranks and titles in the court. In 1167, Kiyomori became the first courtier of a warrior clan to be appointed Daijō Daijin, chief minister of the government, a position which offered much power.
However, the prosperity of the Taira clan did not last long. Kiyomori died from illness in 1181, worrying about the future of his clan. His sons and grandsons were defeated after his death by the Minamoto clan, who eventually started the first military government known as the Kamakura Bakufu in 1192.
Sessai: Despite his achievements, Kiyomori was described as a vicious, cruel dictator in the Tale of the Heike. Do you have any idea why Kiyomori was described like this? There must have been something going on.
This incident tells us something. As you know, we Imagawa clan are one of the strongest in the nation, and my lord aims to dominate the entire country. As a first step, we will march into the capital city Kyoto to gain authorization from the |
<table>
<thead>
<tr>
<th><strong>Shogun.</strong> We will discuss our strategy of managing political power as well as military power.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sessai:</strong> I don't want my lord to end up like Kiyomori, so I really want him to learn from Kiyomori's history. This is why I called you. Now, I want you to investigate Kiyomori's history and figure out what his problem was and why he was described as a villain. Report your findings to me. You have no time to waste. You should find some information in our archive and elsewhere. I will give you some guidance when you need it. Oh, by the way, I want you to take my student with you. He just started his training here. It would be a great experience for him to join your research.</td>
</tr>
<tr>
<td><strong>Joe:</strong> Hi I'm Jotaro. I'm a student of Master Sessai's. You can just call me Joe. Thanks for allowing me to join your research. It is my great pleasure to work with you. We don't have much time for this. We should leave now. Let's go!</td>
</tr>
<tr>
<td><strong>Castle</strong> Joe: Okay, now we are at the gate of the castle. As Master Sessai suggested, we need to look for information about Kiyomori elsewhere. When we are done with our research, we need to go back to report to Master Sessai. Where would you like to go? What kind of information would you like to investigate first? 1. I need to know more about Kiyomori's life. 2. I need to know what Kiyomori's problem was. 3. I have no idea. Tell me what I need.</td>
</tr>
<tr>
<td><strong>Castle 2</strong> 1. Yeah, we don’t know much about him. Need more information. Maybe we should start from the archive. Let’s go! 2. Well, that is our goal, right? We should start gathering information to answer it. Why don’t we go check the archive? It should give us some clues. 3. Oh, then we should start from somewhere, right? I guess the archive is a good start. Why don’t we go check there?</td>
</tr>
<tr>
<td><strong>Archive</strong> Scholar: Hello. This is the archive of the Imagawa clan. I heard you are looking for information about Taira no Kiyomori. You may feel free to look around our archive. Ask me when you have any questions. Do you have any information about Kiyomori? Scholar: Yes, if you don’t know much about Kiyomori, I believe this would give you a clue about him. Take a look at this.</td>
</tr>
<tr>
<td><strong>Timeline</strong> Sessai: Do you need my help? Sure. This is quite a lot of information. So don't be overwhelmed, OK? Focus on what you are looking for. First, find the point when Kiyomori's situation changes. Joe, can you tell when it is?</td>
</tr>
<tr>
<td><strong>Guidance</strong> Joe: OK... This earlier part seems interesting, doesn't it? Kiyomori succeeded in the rebellions, worked on the constructions, and became a chief minister. He even became a father-in-law of the emperor.</td>
</tr>
</tbody>
</table>
Joe: Hmm.. It looks really crowded in the last few years before he died… It looks like he got into nothing but trouble. A coup d'etat against the retired emperor? Afterwards, his situation failed to improve. He died in 1181, and his clan did not last long after his death...

Joe: I still need some more time to digest this information,… What do you think? If you are overwhelmed, why don’t we check other documents first? We could come back and check this later.

Doc 1

Sessai: When you investigate a historical document, you should check its source. When you investigate a historical document, you should check its source in order to gain a better perspective regarding the document. This method is called "sourcing". This document is a good example. The Tales of the Heike was written around the mid-13th century, but the author is unknown. The tale was performed by Biwa hōshi (lute priests) and was enjoyed as entertainment. This kind of information has to be taken into consideration when you make an argument. What is described in this document?

Hey Joe, you answer this.

1. As the tale is written as an epic poem, the facts may have been altered or exaggerated; therefore, the facts should be examined by referring to other sources
2. The tale is reliable because it was written not so long after the historical events occurred
3. The tale is somewhat reliable because the author seems to describe the historical events from an impartial standpoint

Joe: Yes, Master. Let see... I think "2. The tale is reliable because it was written not so long after the historical events occurred" is the answer.

Sessai: Incorrect. You cannot count on historical materials like that. You should keep in mind that proximity in time is no guarantee of accuracy. OK, your turn. What do you think? Choose one.

As the tale is written as an epic poem, the facts may have been altered or exaggerated; therefore, the facts should be examined by referring to other sources
The tale is somewhat reliable because the author seems to describe the historical events from an impartial standpoint

Sessai: That's correct. You have to examine the facts in the document by comparing it with the other documents before you can verify its reliability. This method is called "corroboration."
The problem with the other answer is that you cannot conclude it is written from an impartial standpoint without evidence to support that impartiality. You should go around to other places and find more information.

Sessai: Incorrect. Although it is ok to say that it is somewhat reliable, the problem is that you cannot conclude it is written from an impartial standpoint without evidence to support that impartiality. You have to examine the facts in the document by comparing it with the other documents before you can verify its reliability. This method is called "corroboration."
You may think this is a tricky question, but it isn't. Keep in mind that a historical source does not always tell you the whole truth.
Now you should go around to other places and find more information.
Teahouse

Girl: Hi! Would you like some tea? ... Taira no Kiyomori? Well, I know he was a warrior a long time ago. My teacher taught me that when I was a kid. My grandfather is a fan of the Tale of the Heike, and he tells me Kiyomori was a bad guy. But what I learned in school was a little different. I thought he was kind of a nice person. I can show you my textbook if you want.

*Ssame document as treatment 1
(Source: Jikkinsho 7-27)

Sessai: Oh, you got the Jikkinsho. Good.
The Jikkinsho (十訓抄) is a collection of anecdotes composed in 1252. The stories aimed to teach morals to the youth. The author is unknown.
You should see how Kiyomori was described in this. Hey Joe, What do you think?

Joe: Well, it seems to me that Kiyomori's character is quite different from what I imagined according to the document we just checked in the archive, don’t you think?
It does not look like he deserved to be portrayed as a bad guy, punished by the Judge of the Dead. So why was he described as such a bad guy?

Sessai: Right. That might be another point to consider when you make an argument about Kiyomori.
If you feel you have investigated all the sources thoroughly, you may return to the castle anytime to report your research.
By the way, there are short-cut buttons on the top of this screen. You can access the documents you found quickly. Use them.

Shrine

You walked to the shrine. There is a Shinto priest over there.
Shinto priest: How are you, sir? What can I do for you?

Shinto priest: When I was studying to be a Shinto priest, I heard that Kiyomori funded and constructed Itsukushima shrine in the 12th century.
I think this document tells you what he had done.

Shinto priest: Taira no Kiyomori... Yes. I have heard about him. I saw a document written by historians discussing Kiyomori's situation somewhere here... Here it is. Take a look.

Sessai: You got another document. What did you find in this one, Joe?

Joe: It seems to me that Kiyomori accomplished a lot... He seems to be a wealthy man because he sponsored those constructions.
I just need to go back to the timeline to make sure when these happened. Looking at this document only, it seems he had no need to stage a coup d'etat.

Sessai: Good. Sounds like you are learning what you need.
Kiyomori seemed to have been doing fine at this moment.
So how can you incorporate these different aspects of Kiyomori's history? You might want to consider that.

Sessai: This is written by an expert historian of Japanese history.
If you consider when this situation arose, you will gain a better perspective on what was going on in Kiyomori's life. Considering the chronological order of the information should help you to understand the context better. The method is called "contextualization."
Let's take a further look this document when you are ready. Hey Joe, what did you find?

Joe: Yes, Master. This document describes Kiyomori’s situation when he staged a coup d'etat.
It looks like Kiyomori was in big trouble. I see why he had to take such a drastic approach to grab his political power. Unlucky Kiyomori...

Sessai: Okay, you made a good point here, but can you say it was just because of his bad luck? You may want to think deeper. For now, you still have more documents to check. Go look for them.

Final report

Sessai: Oh, you came back earlier than I expected. So, are you ready to report on your work?

Sessai: If you are not done yet, take more time to finish it. Come back when you are done.

Sessai: Great. Then I am going to ask you some questions to see if you are really ready. Think about this: Which of the following is the LEAST reasonable inference regarding the author of the Tale of the Heike? Joe, you answer first.

1. The author might have known Kiyomori in person.
2. The author might have exaggerated something to make the story more entertaining.
3. The author might have been friendly with Kiyomori's opponents, which included Buddhist monks and aristocrats.

Joe: Yes, Master... The answer is "3. The author might have been friendly with Kiyomori's opponents, which included Buddhist monks and aristocrats," isn't it? It seems to me that we have not found any evidence to claim this...

Sessai: Okay, you are right that you need evidence to justify your inference, but that cannot be "the LEAST reasonable inference". Do you really think it is the least reasonable? Your turn. What do you think?

Sessai: Right. That is the least reasonable among these. You already know that the tale was written in the mid 13th century. As Kiyomori lived and died in the late 12th century, it is not viable to argue that the author knew Kiyomori in person. It is a little far-fetched compared with the other statements. For the other statements, you have some clues to make them more reasonable. You might find this subtle difference a little confusing, but you should be able to see my point if you consider what makes you think it is reasonable. All right, next question. Joe, what could Kiyomori have done to prevent his hardship?

Joe: Well... That's a tough one. I don't know how to answer that... Let's say, “Kiyomori’s problem was his greediness and his opposition to the emperor and the Buddhist monks. That is why he was punished by the Judge of the Dead. He needed to be friendly with the retired emperor. Kiyomori should not have made any enemies related to the emperor. He should have just helped them.” How about that?

Sessai: No. That is far from a good argument. It seems you need more training, and to train harder. Okay, I want to hear your thoughts. How would you advise Joe to
improve his argument?
1. You should consider why Kiyomori could not be friendly with the retired emperor. There is some information found in the document to support this.
2. You should recall that he was described as a nice person in one of the documents.
3. You missed the fact that Kiyomori was friendly to the retired emperor. They were just trapped by the aristocrats.

Sessai: Right. You made my point here. Just claiming without evidence will not make a good argument in history. It seems that you got that idea. For example, the Judge of the Dead is a fictional character. You should not confuse fiction and history like that. Also, if you don’t have enough information to be conclusive, it’s a good idea to state that limitation in your account.

Sessai: That is Okay, but not good enough. It is true that he was described as a nice person but it could be misleading if you only say that. If you want to raise that point, you should also ask why such a nice person had to make enemies and drive himself into a bad situation. Go back and try again.

Sessai: No, that is quite misleading. You have no evidence to claim that they were trapped by the aristocrats. If you have some, you may be able to make a reasonable argument about that, but do you? Again, a wild speculation will not make your argument great. You should always find proof to support your argument. Go back and try again.

Sessai: All right. It seems I'm done for now. Joe needs help on his report, so please check his report before you write your own. Take a good look at his report before you submit yours. Thank you very much for your report, and for taking care of my student. My lord will appreciate your good work.

Note: If you submitted your answer, please go to the "posttest" section and “post survey” section, and answer the questions there.
Appendix D

Guidelines for coding

Determining the code "Problem (situation / act)"

Situation:
- attributing the problem to Kiyomori's tough situations
- explained both Kiyomori's positive/negative aspects
- explained situational motives/reasons

Act:
- attributing the problem to Kiyomori's tyrannical or violent actions
- not explaining situational motives

(*Restricted act:)
- mentioned positive aspects but disconnected from the argument
- absence of situational motives/rationales (even if mentioning positive aspect)

Points to consider for the borderline ones:
- Inclusion of the elements below makes the code "multiple perspective".
- However, it is not necessarily "Situation" if just mentioned without supporting situational argument. In such case, "Restricted act" may be appropriate.

The possible elements that students could use in their argument: (for multiple perspective)
- historiographical view (inferring author's stance/bias/propaganda)
- class issue (Aristocrats' prejudice to warrior class)
- unpopularity of Kiyomori and his family
- alienation from provincial warrior families
- Kiyomori's financial situation (caused by the death of his daughter and son)
- Kiyomori's good character (kind to his people)
- Kiyomori's accomplishments (sponsorship to the constructions)
- Hypothetical situation to argue a possible situation

Kiyomori's actions. (Code act & one-sided, if only mentioned these)
(-> tyrannical or violent actions, or bad political decisions by Kiyomori)
- won the battle against the rivalry clan
- burned down the temple and attacked Buddhist monks
- sought political power too fast
- discarded his strength in provincial area to gain leadership in the central court
- occupied the court government by putting his family in higher-rank position
- staged a coup and house arrested the former emperor
- arranged a marriage between his daughter and the emperor
- stopped the conspiracy against him and killed the conspirators
- being a victim of rivalry (it looks situational, but it was caused by his action)
Appendix E

Informed Consent Form for Social Science Research

The Pennsylvania State University

Title of Project: The effectiveness of narrative-based instruction to promote historical thinking

Principal Investigator: Toru Fujimoto, Graduate Student
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1. Purpose of the Study: The purpose of the research is to articulate the effectiveness of narrative-based instruction for the instruction of historical thinking.

2. Procedures to be followed: You will be asked to conduct a web-based learning activity to learn Japanese history, complete survey, and answer questions regarding what you learned in the activity.

3. Duration: The session requires approximately 50 minutes.

4. Statement of Confidentiality: Your participation in this research is confidential. The data will be stored and secured on the ANGEL server. In the event of a publication or presentation resulting from the research, no personally identifiable information will be shared. Your confidentiality will be kept to the degree permitted by the technology used. No guarantees can be made regarding the interception of data sent via the Internet by any third parties.

5. Right to Ask Questions: Please contact Toru Fujimoto at (814) 360-3490 with questions or concerns about this study.

6. Payment for participation: By participating in this study you will earn extra credit for your class which amounts to 3% of the entire course grade.

If you do not want to participate in this study, but would still like to earn the 3% extra credit, you will be asked to prepare a three-page response (1500 words) to a question related to your course. Your response will be graded. You will be provided further details about this option if you choose to not participate in this study.
7. Voluntary Participation: Your decision to be in this research is voluntary. You can stop at any time. You do not have to answer any questions you do not want to answer.

You must be 18 years of age or older to take part in this research study. If you agree to take part in this research study and the information outlined above, please sign your name and indicate the date below.

______________________________________________
Participant Name                      Signature     Date

______________________________________________
Person Obtaining Consent               Date
EDUCATION:

**Doctor of Philosophy, Instructional Systems** (May 2010)
Department of Learning and Performance Systems, The Pennsylvania State University, USA

**Bachelor of Arts, Environmental Information** (March 1997)
Department of Environmental Information, Keio University, Japan

WORK EXPERIENCE:

**Chief Researcher**, Industry-Academia Collaboration Initiative Nonprofit Organization, Japan
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**Part-time Lecturer**, Department of Environmental Information, Keio University, Japan (April 2010- Present)

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