

CHARACTER-EYES

Story-driven Inquiry from a Character's Viewpoint

Annika Wolff, Paul Mulholland and Zdenek Zdrahal
Knowledge Media Institute, The Open University, Walton Hall, MK7 6AA, Milton Keynes, U.K.

Keywords: Narrative, Inquiry-based learning.

Abstract: Inquiry-based learning encourages students to pose questions, find and interpret multiple pieces of evidence and to present conclusions in a coherent presentation. The goal of this research is to demonstrate that narrative and story can support inquiry learning on a number of different levels. Characters who undertake familiar inquiry processes, such as a detective or an investigative journalist, can act as a focus around which an inquiry task can be conducted and a story can be constructed. These characters are intended to support a learner by helping them to understand the sorts of activities they may need to do in their own inquiry. More functional aspects of narrative can also underpin the process of the inquiry and assist a learner in understanding important relationships between facts. Finally, parallels between narrative structure and an inquiry process can be exploited to support a learner through the different stages of inquiry and provide help in producing the output and constructing a story, based on the conclusions of the task.

1 INTRODUCTION

Since an inquiry-based learning approach has been shown to increase engagement and have a positive effect on student learning, inquiry processes have become more common-place in the classroom. How teachers choose to interpret the inquiry process can vary, but essentially students are required to approach a task through an active phase of evidence gathering, which is interpreted in view of the initial learning goal as well as incorporating additional questions or issues which arise during the process of inquiry.

In a truly open inquiry, the student will decide their own topic of investigation and undertake it entirely by themselves. But choosing a topic, selecting a driving question (Wallace et al., 1998) with a suitable scope and then locating and interpreting appropriate sources are skills that most students must first learn. Students who are generally unfamiliar with an inquiry-based approach may not be used to dealing with multiple information sources and may have difficulty dealing with the amount of data they are generating and in relating this to their inquiry question. They might wonder what to do when they come across information which is at a tangent to their main goal, suggests further avenues for research, or is contradictory to what they thought

they would find. Novice inquiry learners require help in developing these skills of inquiry (Kirschner, Sweller & Clark, 2006; Mayer, 2004). Therefore, most teachers use a form of guided inquiry which provides a framework and some instructions for conducting the investigation (Conole et al., 2008; Dillenbourg and Jermann, 2007; Martin-Hansen, 2002). In many cases, teachers also provide the set of resources from which the student can complete the task.

This research proposes that principles of narrative can be used to guide a student's inquiry, help to keep them on track in completing the task and aid the production of a coherent narrative output. Since people are primed to remember narratively structured experiences more easily than those which don't conform to an expected form of narrative (Thorndyke, 1977, Wolff et al., 2007), the use of narrative should create a memorable tool that can be easily recalled and reapplied to new inquiry scenarios.

2 NARRATIVE SUPPORT FOR LEARNING

It is generally accepted that people are narrative-

thinkers. Stories have a property of coherence which makes them easier to understand than events which are conveyed in a seemingly unrelated fashion. Thus, organising facts and events into stories and using this to support learning is a well studied topic of research. Narrative tools to support learning take different forms. Some systems attempt to immerse a learner in a virtual story world, where they become a character carrying out important parts of a dramatic plot (Mott et al., 2006; Thomas and Young 2007). This approach requires that the learner is fairly constrained in their possible actions, if they are not to stray outside the prescribed narrative boundaries. Other tools take a more subtle approach, using narrative principles to organise content, or to convey important information in an easily digestible format, whilst allowing the learner more agency over their actions (Plowman et al., 1999). These systems tend to be less dramatic or character-based. There are advantages and disadvantages to both types of approach. A dramatic plot can be more engaging, particularly if it employs narrative effects such as rising tension and if the characters are well chosen. Constraining the plot also makes it easier to maintain coherence. However, the lack of control can be frustrating for a user and if the chosen story does not appeal to them, or if it doesn't gel with the topic of inquiry, then this diminishes engagement. Conversely, the greater control the user has, the less dramatic elements can be used to good effect and the harder it is to maintain a coherent story-line. But, having the freedom to be active in the task is beneficial for learning. This research will endeavour to find a balance where it is possible to combine the best parts of both types of narrative approach to support inquiry-based learning tasks.

3 NARRATIVE AND INQUIRY

The basic structure of an inquiry process has many similarities to the basic structure of a narrative, as demonstrated in the following table. The narrative version is presented from the perspective of an author whilst the inquiry is from the perspective of a learner conducting an open inquiry:

Table 1: Parallels between narrative and inquiry.

	Narrative	Inquiry
1	<i>Theme:</i> Introduce the theme and the main characters.	<i>Topic:</i> Introduce the topic and background to the investigation.
2	<i>Conflict:</i> Pose a conflict for the main character to overcome.	<i>Learning goal:</i> Pose a driving question to investigate and provide an answer to.
3	<i>Resolution attempts:</i> Outline what the character does to overcome the conflicts, introduce at least one further obstacle that the character must overcome before the final resolution of the original conflict occurs.	<i>Evidence gathering:</i> Gather and interpret evidence to see how it addresses the learning goal. A good inquiry question should prompt some further, more detailed questions, before the more complex learning goal is achieved.
4	<i>Epilogue:</i> Bring the narrative to a close, tie up loose ends.	<i>Conclusions:</i> when all questions are answered, what are the main conclusions with respect to the learning goal?

Elaborating on the parallels between narrative and inquiry, the person who is conducting the inquiry can be thought of as a character, participating in events which can ultimately be related as a story. This story offers a particular route across a set of related facts and events that constitute the narrative space. The events occur in a temporal order, although they are not always presented in that order (e.g. flashbacks and flashforwards). Readers of such narratives will try to mentally reconstruct a timeline in order to understand how events are causally related. If an author fails to indicate temporal disruptions, then the plot will lose coherence (Genette, 1980; Kafalenos, 2006). Also, stories that are told from the same set of narrative facts may differ in perspective, outcome or even mode of presentation. Facts may be omitted or included in accordance with the focus of a specific story – or, for inquiry, with respect to the learning goal and the stated questions. Therefore, a narrative space may yield a number of different story interpretations.

These sorts of differences can be illustrated using the example of *historical inquiry*. Traditionally, students have learned history by rote learning of facts from pre-constructed stories, which generally convey just one particular perspective of the historian who created it. More recently, history

has been taught through inquiry, using a range of materials including some primary sources. Students are encouraged to construct their *own* stories using these sources. They thereby come to understand that historical stories are based on an interpretation of the available evidence and that multiple interpretations may exist, especially where there is conflicting information. Some tools exist to support historical inquiry in the classroom. These generally provide a framework for a guided inquiry, but in a historical context (e.g. GATHER by Anderson-Inman and Kessinger, 2000; SCIM-C by Hicks et al., 2004^b). Two related approach which attempt to make the narrative link much stronger, but in a subtly different way, are HSI - Historical Scene Investigation (Hofer, Swan and Whitaker, 2004) and The Mystery of Sam Smiley (Hicks et al., 2004^a). In these approaches, the task is set in the context of an actual investigation. In Sam Smiley, the student investigates a fictional disappearance of a character called Sam Smiley. They undertake an inquiry process, but they are in the role of a detective investigating the case. All of the resources are themed, so instead of being data sources, they are witness statements, a list of physical evidence from the scene etc. This task is intended to be an introduction to teach students about inquiry. Related to this is HSI, where the students look at actual history sources to answer a real inquiry question, but the task is themed to be like a crime scene, so that the students can easily relate the processes to something they already understand. The common theme is using narrative to both engage learners and to help them understand some of the actual inquiry processes that they will need to undertake by parallels to the common activities of the detective character.

4 PROPOSED NARRATIVE SUPPORT FOR INQUIRY LEARNING

The narrative support proposed in this paper is based on similar principles. It is aimed at helping the learner to understand an inquiry task in the context of a known story schema. Learner's must choose a character for the task, from a selection of *detective*, *investigative journalist*, *scientist* or *archaeologist*. Each character-type specialises in slightly different types of inquiry, so the choice may be influenced by the attributes of the task. Specifically, the character choice and the driving question must be consistent

so a detective might tackle solving a 'mystery' which involves collecting and analysing evidence within a fairly small time-frame, an investigative journalist might try to offer a new perspective on an old story by looking for new evidence or information that conflicts with an accepted viewpoint, a scientist would deal with data driven tasks and an archaeologist might try to answer questions that involve longer periods of time and have an emphasis on location. The learner then 'becomes' their character, undertaking the inquiry and creating an appropriate output, e.g. a detective produces case-notes, a journalist creates a news report, a scientist outputs a scientific paper and an archaeologist curates a display of artefacts based on their findings. The learner isn't overly constrained by the story or their character with regards to the types of activities they can undertake as part of the inquiry, they are free to choose what they want to do. The story is, at this level, meant as a prop to help the learner and to keep them on track with the process, through analogy to the pre-supplied story-schema.

In the next stage of the inquiry process, the learner will undertake a generally iterative process of browsing resources, evidence gathering and reflecting on progress towards answering the inquiry question. During this process the learner should be able to effectively discover, from the available resources, the set of events that can ultimately be used to create a chain of reasoning, in the form of a coherent narrative, to support their eventual conclusion. A learner might begin this process by first specifying some more focused questions to drive their research and then looking for this information amongst the resources. Alternatively, they may immediately begin looking at the resources, using only information from the driving question as guidance on what to look for, and then adding further questions as they arise during inquiry. In either case, it is likely that the relevant events and information will be encountered out of sequence and that the learner must somehow restructure the information in order to firstly generate hypotheses and then to create their narrative output.

In this stage, learners will be assisted in making summaries of the resources, by way of tagging (under five categories: event, people, place, objects and time, which are informed by narrative principles) and through the creation of surrogates (either thumbnail images or short text descriptions) that can be more easily manipulated. A resource summary should describe either a single event or else some potentially relevant background

information. Therefore, a resource may be linked to more than one resource summary. These summaries provide a more manageable unit from which the learner can create narrative. The process of building the narrative involves firstly grouping the surrogates - using the summaries as a guide - according to either low-level features (such as people, place) or thematic links and then organising them in a way which will assist the learner in identifying important relationships between them. In narrative, an important sequence is temporal order, with causal links in between events on the timeline (or to background information). To this end, the learner will be assisted in constructing a timeline of events, within which they can visualise common patterns amongst events and also to recognise where information is missing or contradictory. This information can be automatically visualised to the learner, based on the tags they have supplied to each resource summary. Examples include:

- *Inconsistency*: a person or object is indicated as being in two different places at the same time; the same event is shown to occur at two different times.
- *Pattern*: the same sort of event was happening in different places/at different times; a similar set of objects were found at place A, time A as at place B, time B – is there a connection? E.g. in archaeology, if 15th century household objects are found at location A and 16th century ones are found at location B, which is close-by, might there have been an event which would have caused a community to move from one place to another at that time?
- *Missing Information*: if the same event is happening in different places, is there a common trigger that can be found, e.g. an event that occurred in the same time-frame prior to each of them? Might one have influenced the other?

Visualisations may help a learner answer one or more inquiry questions, or else may prompt a further inquiry question to be added, e.g. to find missing information, resolve conflicting information or open up a new avenue of inquiry. Since it is not always possible to find missing information or conclusively resolve conflicting accounts, the learner (in the form of the character doing the inquiry) must be prompted to speculate some reasonable explanations to fill the gaps so that the narrative can be completed coherently. Another measure that can be used to indicate coherence is that the learner has answered all questions. But the learner must also recognise

when to prune questions which lead away from the learning goal. In order to drive the inquiry, the student will be prompted to consider what questions remain unanswered and how to answer them, as well as whether the remaining questions are still valid.

This whole process of posing questions, browsing and tagging resources, grouping and sequencing resource surrogates and revisiting the questions is an iterative one. The grouping and linking may start out tentative, but subsequent revisions and the addition of new information should, over time, lead to a coherent description of events and the relationships between them sufficient for constructing the narrative response to the original inquiry question.

The main focus for producing the narrative output surrounds the questions and answers. Students will be supported in organising all their data around the questions, in adding new questions, or in removing questions that lead off on tangents. The driving question *must* have a related conclusion in order to create the story and sub-questions should also have answers if they are to be included in the narrative. Students can organise their questions to reflect the order in which they want to convey their narrative. When they come to produce their output, in whatever form it takes, the overall structure must consist of the *topic introduction* (which may be summarised from what was originally presented to start the task), a statement of the *learning goal* and all of the *evidence* (which is the questions and answers created during the inquiry process) that will support the *conclusions*.

Learners who are unsure of the story-schema, or how it relates to an inquiry task, can choose additional passive, or active, help. If they choose active help they will undertake a tutorial task which grounds the activity in a more standard story-setting. So, the detective will solve a real detective task, such as investigating a disappearance, or an archaeologist will be piecing together evidence from several excavation sites to decide who lived there and what those sites were used for. Alternatively, these tasks might be used by the teacher as a training tool, prior to giving a real inquiry task. Passive help is similar but instead of actively doing the task, the learner is given examples of activities that their chosen character might do at that stage of the inquiry, e.g. “A detective would build up character profiles and construct timelines to see when events occurred” or “An archaeologist would try to find multiple pieces of evidence to support their conclusions”

Work has begun on implementing the interface, using Drupal, through the development of four distinct modules. These are:

1. *Story Schema*: Choosing and applying a story schema. This story schema is then applied to the inquiry interface and affects presentational aspects and is also used to provide learner help that is specific to the types of tasks that the chosen character might do.
2. *Inquiry Questions*: Handling the setting, modifying and sequencing of questions and subquestions as well as the learners responses. The driving question should be consistent with the character choice. This module allows questions and subquestions to be proposed, re-ordered and answered and for resources and their associated tags and comments to be linked. This module is where the narrative is created out of the inquiry process, as all of the information that is collected during inquiry appears here in an organised form. In the final narrative, the learner can choose to show or hide elements, or add in extra lines of text to improve the narrative flow.
3. *Resources*: Tagging and summarising resources and creating surrogates.
4. *Visualisations*: creating groupings from the surrogates, sequencing them and identifying relationships between them. This is both learner-led and supported by reasoning strategies applied to the resource data.

5 CONCLUSIONS AND FUTURE WORK

This paper proposes that narrative can support inquiry learning in two distinct ways. Firstly, by providing a story framework within which the processes of the inquiry can be more easily understood and by using this schema to provide both pre-task training and in-task assistance to the learner. This framework, based on characters such as detectives and journalists, is also intended to increase engagement with the task. Secondly, narrative can support the organisation of information into coherent units that constitute the narrative space from which stories can be constructed. Furthermore, the similarities between the four stages of an inquiry process and the four stages of a narrative can provide a starting point for creating the story, by

indicating important narrative elements to include (theme, conflict, resolution attempts and epilogue) all of which have been created in some form through the inquiry process.

Future work will involve implementing the core narrative functionality and conducting studies to see if narrative elements have a positive influence on performance in an inquiry task.

REFERENCES

- Anderson-Inmann, L. And Kessinger, P. (2002) Promoting Historical Inquiry: GATHER Model. http://anza.uoregon.edu/TeachersWWW/Gather_model.html
- Conole, G., Scanlon, E., Kerawalla, C., Mulholland, P., Anastopoulou, S. and Blake, C. (2008). From design to narrative: the development of inquiry-based learning models. *ED-MEDIA World Conference on Educational Multimedia, Hypermedia & Telecommunications*. Vienna, Austria.
- Dillenbourg, P. and Jermann, P. (2007), Designing integrative scripts. In F.Fischer, I. Kollar, H. Mandl and J. M. Haake (eds) *Scripting computer-supported collaborative learning*, NY: Springer.
- Genette, G. (1980). *Narrative Discourse. An Essay in Method*. Cornell University Press, NY.
- Hicksa, D., Carroll, J., Doolittle, P., Lee, J., & Oliver, B. (2004). Teaching the mystery of history. *Social Studies and the Young Learner* 16(3), 14-17.
- Hicksb, D., Doolittle, P. E., & Ewing, T. E. (2004). The SCIM-C strategy: Expert historians, historical inquiry, and multimedia. *Social Education*, 68(3), 221-225.
- Hofer, M., Owings Swan, K. & Whitaker, S. (2004). The Historical Scene Investigation (HSI) Project: Facilitating Historical Thinking with Web-Based, Digital Primary Source Documents. In R. Ferdig et al. (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2004* (pp. 4801-4806). Chesapeake, VA: AACE.
- Kafalenos, E. (2006) *Narrative causalities*, Ohio State University Press
- Kirschner, P. A., Sweller, J. & Clark, R. E. (2006). Why minimal guidance during instruction does not work: an analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist*, 41(2), 75-86.
- Martin-Hansen, L. (2002) http://people.uncw.edu/kubaskod/NC_Teach/Class_2_Teach_Strat/Teaching_Strategies/DefiningInquiry.pdf
- Mayer, R. E. (2004). Should There Be a Three-Strikes Rule Against Pure Discovery Learning? The Case for Guided Methods of Instruction. *American Psychologist*, 59(1), 14-19.
- Mott, B., McQuiggan, S., Lee, S., Lee, S. Y., and Lester, J. (2006) Narrative-centered Environments for Guided Exploratory Learning. *In Proceedings of the AAMAS*

- Workshop on Agent-Based Systems for Human Learning*, Hakodate, Japan
- Plowman, L., Luckin, R., Laurillard, D., Stratfold, M. and Taylor, J. (1999). Designing Multimedia for Learning: Narrative Guidance and Narrative Construction. *Proceedings CHI'99: ACM Conference on Human Factors in Computing Systems*, Pittsburgh, PA, USA, 15-20 May 1999, 310-317.
- Thomas, J. M. and Young, M. (2007). Becoming Scientists: Employing Adaptive Interactive Narrative to Guide Discovery Learning, *AIED-07 Workshop on Narrative Learning Environments*, Marina Del Rey, California, USA
- Thorndyke, P. (1977). Cognitive structures in comprehension and memory of narrative discourse. *Cognitive Psychology*, 9, pp. 77-110.
- Wallace, R., Bos, N., Hoffman, J., Hunter, H. E., Krajcik, J., Soloway, E., Kiskis, D., Klann, E., Peters, G., Richardson, D. and Ronen, O. (1998) ARTEMIS: Learner-Centered Design of an Information Seeking Environment for K-12 Education. In: *Proceedings of CHI '98*. ACM 195-202
- Wolff, A., Mulholland, P., Zdrahal, Z. and Joiner, R. (2007) Re-using digital narrative content in interactive games, *International Journal of Human-Computer Studies*, 65, 3, pp. 244-272

