Learning designs / Products of the AUTC project on ICT-based learning designs

POE Tasks Supported by Multimedia
Generic Guidelines for Instructors

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Request: A web-based multimedia library of (completed) multimedia-based POE tasks is currently under construction. If you (or your students!) use these templates to create a multimedia-based POE task, please contribute to this online library by emailing your completed task to: matthew.kearney@uts.edu.au *Thanks*.

1. Background

Multimedia-supported POE tasks may be used as a diagnostic, pre-instructional assessment tool or a summative assessment tool. If task scenarios are chosen carefully, responses to these tasks are typically thoughtful and can potentially probe students' real, strongly held personal views (in contrast to inert, formal 'school knowledge') in a given discipline (White & Gunstone, 1992). Hence, one of the 'supportive' roles of computer-based POE tasks is to automatically (and unobtrusively) record student responses and collate them into a teacher-friendly document that can be used to plan subsequent instruction and assess common alternative conceptions. If necessary, tasks can be scored (see White and Gunstone, 1992, p.62 for details).

Apart from this diagnostic function, these tasks have many associated positive learning outcomes for students. When used in a peer learning environment, these outcomes may be more meaningful, depending on the appropriate selection of partners, student familiarity with peer learning strategies and teacher facilitation during the tasks. For example, the tasks can encourage students to articulate, debate, justify and generally reflect on their own and their partner's views and negotiate new shared meanings (Kearney, 2002). Indeed, the use of appropriate computer-based POE tasks encourages instructors to use small group arrangements as an alternative to traditional, whole class demonstrations. (This type of peer collaboration at the computer enhances student control over their pacing through each task, especially in the crucial observation stage—see Kearney et al., 2001) In *science*-based tasks, students may be interested in performing their own 'real-life', off-computer, mini experiments to help them consider their task responses. A designated, small area away from the computer is recommended for these types of activities.

An important pedagogical consideration is how the tasks are 'followed up' in subsequent lessons. Further small group or whole class discussions are recommended, preferably with further exposure of selected responses and common alternative conceptions (e.g. see the group discussion strategies discussed in Gunstone, McKittrick and Mulhall, 1999).

For more extensive information on the learning design, go to the *Learning Designs Web Site at* http://www.learningdesigns.uow.edu.au

2. Procedure for using the software shell to create a computer-based POE task

The following guidelines are designed for instructors (from any discipline) who want to use the POE software shell to create a POE supported by multimedia.

- *Find or create the following multimedia-based resources:*

  ELEMENT1.
  An appropriate video / sound / photographic-based demonstration depicting a relevant scenario.
  ELEMENT(s)2.
  A photograph(s) that helps students to visualise the scenario eg. for video-based demonstrations—a frame from the actual film clip. If you have access to graphic editing software such as PhotoShop, you may like to edit the photo by adding extra arrows, text etc.. In some cases, you can make the photo into a multiple choice item by adding appropriate letters that match the options you create on the prediction page. (NB. For graphic-based tasks involving a photographic demonstration, choose another photo here that helps communicate the context of the scenario to the user.)
  ELEMENT3 (optional)
  A video / sound / photographic-based preview that helps users to become more familiar with the given scenario. Eg. for video-based demonstrations—the first few frames of the video could be shown—of course stopping before the demo outcome is revealed. For photographic-based demonstrations, choose another photo here that helps communicate the context of the scenario to the user. A combination of media files is possible here - for example, a graphic and some narration.

- *Download the appropriate POE software shell. You have a choice of 2 formats:*
  a) a multiple-choice format or
  b) a drawing format
  (See Notes in Section 3 for further discussion about this choice.)

- *Insert the following multimedia-based resources into the POE Software Shell:*
  a) Insert **Element1** into Page 6 of software POE shell
  b) Insert **Element(s)2** into Pages 1, 3, 4, 5, 7 and 8 of the POE shell
  c) Insert **Element3** into Page 2 of software POE shell (optional). Otherwise, type *No Preview Needed.*

- *Insert the following text into the POE Software Shell:*
  a) Insert **a title** and **description of the context** into Page 1 of software POE shell
  b) Insert **a key question (relating to the demonstration)** into Page 3.
  c) Insert **3 multiple choice options** into Page 3. NB. These options should be based on research from the literature or alternatively, previous trials of the task with some sample students. (Multiple choice format only).
  d) Insert **a sample prediction, observation and explanation** (eg. from a previous user) into Page 8. These descriptions will serve as a model for the students in the difficult *explanation* phase (optional). Otherwise, type *No Sample Available*.

3. Notes to accompany each page of the POE software shell

Special technical and pedagogical considerations relating to the creation and use of each stage of the POE Task are made here.

Note1: When saving your final (edited) pages, **keep the same file names: '1.htm', '2.htm'** etc. as the 'next' buttons on each page are automatically 'programmed' to find these file names. Ie. *Do not change the names of these files*.
Note2: you must **include the 'support' folder in the same *relative location* to your html pages**. (This folder 'carries' all the background images etc. and hence needs to be included with your final task. Ie. Include this 'support' folder in your final task and *do not change the relative 'location' of the 'support' folder* from the other files.)
Note3: To advance on screens requiring typed responses, **it is necessary to type at least 5 words** in the space provided.

Page One: Introduction To Task Context (1.htm)

* The photograph *(Element2)* depicts the context of the Demonstration. For video-based demonstrations, this graphic could be taken from a frame of the video. This photograph (or other similar ones) is also used on pages 3, 4, 5, 7 and 8.
* Best to choose real-life situations (ie. avoid excessive use of animations, cartoons etc. to depict scenarios) that are prone to alternative conceptions and help students link scenarios to their real world views. Chosen contexts should depict dangerous, challenging or time-consuming situations that are normally not possible or difficult to observe in real-life, class-based demonstrations.
* Be careful to use jargon-free language suitable for users' level of discipline expertise.
* Many students will still want face to face help from the teacher at this point of the POE strategy. NB. It is crucial that the user is absolutely clear about the context before proceeding to the prediction stage. For this reason, there is an opportunity on the next page to place an extra photograph or small 'preview' of the video or sound.

Page Two: Intro to Task Context cont. (2.htm)

* This preview (*Element3*) is optional but may serve to help students feel comfortable with more complex task settings before making their predictions.
* For photographic-based demos, an alternative photo may be used here.
* The preview must give no clues about the demonstration outcome and of course must stop before the demo outcome is shown.
* For text-based demos, the use of a voice narration may be used here. For example, part of a poem or story may be narrated to the user for a *literature* POE task (& users will then be asked to predict the completion of the story / poem etc. based on their understanding of the author etc.)

Page Three: Prediction (3.htm)

* Use a *multiple choice format* if there are only a limited number of possible outcomes for your demonstration. Even in this case, an "other" option is needed to cater for students' unexpected predictions. If there are numerous possible options and the nature of the task is suitable, choose the *drawing format* and supply students with a pen and paper worksheet.
* Insert 3 multiple choice options in the space provided on this page (e.g. if using Dreamweaver, use the textfield properties box belonging to each text field). All multiple choice options should be chosen based on research (e.g. in *science* education— alternative conceptions research. See for example, Driver et al., 1994) or previous surveys / use with students.
* Be careful to use jargon-free language suitable for users' level of discipline expertise.

Page Four: Commitment Levels (4.htm)

* This section provides particularly valuable feedback for the teacher on 2 levels:
    - the mutuality of group responses
    - the level of commitment (or uncertainty!) in users' responses

An extensive discussion of this type of facility is discussed in Dawson and Rowell (1995)
* The software presents the students' prediction on the screen (*multiple choice format* only) at this point to remind them of exactly what they predicted.
* The Back button is essential for students who decide that they want to change / edit their prediction. (NB. They don't really get an opportunity to do this in traditional teacher-centred POE tasks).

Page Five: Reason (5.htm)

* This section is challenging for students. Students can often choose the 'correct view' for their prediction but struggle with their reason. This is one of the real powerful stages of the POE strategy as it goes beyond normal multiple choice assessment techniques.
* Students also should be encouraged to write full sentence responses and come to a mutual agreement with their partner before writing their reason. (NB. The software is programmed to demand a minimum 5-word requirement for most text fields.)
* The software presents the students' prediction on the screen (*multiple choice format* only) at this point to remind them of exactly what they predicted and help with their reasoning.
* Once again, the Back button is also useful for students who decide that they want to change / edit their prediction. Indeed, students need to be aware that once they go to the next page (*Observation* of the demo.), they cannot go back and edit any predictions and reasons! ie. This computer-mediated 'scaffolding' of the POE strategy should facilitate a high level of student commitment to (and associated reflection on) their predictions and reasons before actually viewing the outcome of the demonstration - an important part of the POE strategy.

Page Six: Observation (6.htm)

* Perhaps the most crucial stage of the POE strategy as it provides *the feedback* for the students on their earlier prediction.
* The demonstration (*Element1*) should take advantage of the computer environment and not simply reproduce an event that can easily be shown in class. For example, chosen contexts should depict dangerous, challenging or time-consuming situations that are normally not possible or difficult to observe in classroom environments.
* Real-life contexts are recommended to help students link scenarios to their real world views—hence, avoid use of animations, cartoons etc. to depict scenarios.
* Obviously, the outcome of the demonstration must be clearly visible / audible from the sound / video / photo.
* Demonstrations should depict real-life situations that are prone to alternative conceptions.
* The demonstration should preferably contain an element of surprise.
* The demonstration should preferably involve first hand observation of an event. If this is not possible, 2nd hand observations can be made (e.g. in *Science*, using an instrument such as a thermometer; in *Geography*, using representations such as maps or in *History*—using a Newspaper clipping etc.).
* It is possible to combine the use of sound and video, although narration of a demonstration is not recommended as it would impede on the user's observation. An example from *science* where this combination could be useful would be a video of lightning with the sound of thunder. (Students would be asked to predict the answer to the classic question: "would you see the lightning before, after or at the same time as you hear the thunder?")
* Other combinations are also possible (eg. Sound and graphic)
* Students should be encouraged to write full sentence responses and come to a mutual agreement with their partner before writing their observation. (NB. The software is programmed to demand a minimum 5-word requirement for most text fields.) In tasks using the *drawing format,* students will also be asked to draw their observations.

Page Seven: Explanation (7.htm)

* This is perhaps the most challenging stage of the POE strategy for students. Hence, the facilitation role of the teacher during this stage is crucial. (NB. Indeed, if students have not had much experience with the POE strategy, it may be beneficial to transfer this whole 'explanation' stage to a whole class discussion mode.)
* In recognition of this challenging stage, a *help* section is provided where students can access a sample explanation based on the particular task.
* The software automatically presents the students' earlier (recorded) prediction and observation on the screen at this point. This provides students with a facility to help them make necessary comparisons and resolve any differences.
* Students can also use the Back button to return and review the actual demonstration to aid their reflection (again, this is much easier to do in a multimedia setting that using a real-life demonstration).
* Students should be encouraged to write full sentence responses and come to a mutual agreement with their partner before writing their explanation.
* When students click on the *Finish* button, they should have the opportunity to print out their responses (e.g.. as a text file) or email it to their teacher.

Page Eight: Help with Explanation- Model of a Sample Response (8.htm)

* Teachers can insert a quality, sample student response from preliminary use of the task. There is a need to emphasise to students that these sample responses do not necessarily represent 'correct science views' but model detailed, thoughtful 'explanations'.
* The sample responses should model the level of thought and explanation needed at this difficult stage. However, instructors choosing appropriate responses for this section need to be mindful of the constructivist nature of the program and not choose samples that attempt to 'tell' students the correct science view (this can be addressed in later class discussions).

Summary Page (finish.htm)

* Finally, a **Summary Page** is displayed that summarises the students' responses at various stages of the task (prediction, reasons, etc.)
* A 'follow-up', related task may be linked to this final summary page. Usually, subsequent tasks are used to probe a students' conceptual understanding more deeply. For example, a similar task can be presented with a subtle change of a key variable.
*Students will have the opportunity to print out these responses or email it to their teacher.

4. General points

* *When saving your final (edited) pages*, **keep the same file names: '1.htm', '2.htm'** etc. as the 'next' buttons on each page are automatically 'programmed' to find these file names. Ie. Do not change the names of these files.

* Keep the 'support' folder in the same *relative location* to your html pages. (This folder 'carries' all the background images etc. and hence needs to be included with your final task. Ie. Do not change the relative 'location' of the support folder from the other files.

* To advance on screens requiring typed responses, **it is necessary to type at least 5 words** in the space provided.

* Small graphics (or 'process prompts') are placed at key points on many pages to prompt engagement in important processes in the POE strategy. Eg. points where students should initiate *discussion* with their

partner(s), where they should *observe* (using eyes and/or ears) carefully, or where they are required *to write* in a thoughtful manner.

* The software allows users to 'go back' and edit responses until they reach the observation page. After they reach there, they can no longer go back and edit predictions, reasons etc.

* To further probe student understanding, you may consider creating a 2nd related POE task with a change of one significant variable. An example from *science* may include the change of location of an experiment from the Earth to the Moon; or a change in a property of an object (mass, speed etc.) in the demonstration.

* An added challenge for instructors following constructivist pedagogy is to ask students to film their own scenarios!

5. Samples

The following samples are available at the *Learning Designs Web Site (at* http://www.learningdesigns.uow.edu.au) and should show the flexibility of the POE templates and provide appropriate examples of multimedia-based POE tasks. For any sound-based tasks, you will need your computer's speakers turned on.

Sample 1: Car Launch (Physics). Drawing format / video-based. 1.7Mb
Sample 2: The Sky (Astronomy). Drawing format / photographic-based. 360K
Sample 3: Jeannie Baker (Art). Drawing format / photographic-based. 500K
Sample 4: Car Horn (Physics). Multiple choice format / sound-based. 244K
Sample 5: Hammer & Feather (Physics). Multiple choice format / video-based. 4.6Mb
Sample 6a: Heavy Ball & Cup (Physics). Multiple choice format / video-based. 1.5Mb
Sample 6b Light Ball & Cup (Physics). Multiple choice format / video-based. 2.1Mb
NB. Tasks 6a and 6b are linked.
Sample 7. Music Composer. (Music). Drawing format / sound-based. 300K

Note : To advance on screens requiring typed responses, it is necessary to type at least 5 words in the space provided.

6. References

Dawson, C., & Rowell, J. (1995). Snapshots of uncertainty: a new tool for the identification of students' conceptions of scientific phenomena. *Research in Science Education*, *25*(1), 89–100.

Driver, R., Squires, A., Rushworth, P., & Wood-Robinson, V. (1994). *Making sense of secondary science. Research into children's ideas*. London and New York: Routledge.

Gunstone, R., McKittrick, B., & Mulhall, P. (1999). Structured cognitive discussions in senior high school physics: Student and teacher perceptions. *Research in Science Education, 29*(4), 527-546.

Kearney, M. (2002). *Classroom Use of multimedia-supported predict-observe-explain tasks to elicit and promote discussion about students' physics conceptions*. Unpublished PhD dissertation, Perth: Curtin University of Technology. (Click here to view)

Kearney, M., Treagust, D., Yeo, S., & Zadnik, M. (2001). Student and teacher perceptions of the use of multimedia supported predict-observe-explain tasks to probe understanding. *Research in Science Education, 31*(4), 589-615. (Click here to view)

White, R., & Gunstone, R. (1992). *Probing understanding*. London and New York: The Falmer Press.