

The 2018 Research Psychologist's Guide to GIFT

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INTRODUCTION (DON'T PANIC)

When approaching making a sequel, whether it is a movie, book, or even a research paper, one of the goals is to recapture the elements that people enjoyed about the original, while building on it to provide a wholly new experience. A long time ago (4 years), in a galaxy not so far away, I wrote the first version of “The Research Psychologist’s Guide to GIFT” (Sinatra, 2014). I started my guide with two important words: “Don’t Panic”. I also was sure to start my 2016 sequel to the guide (Sinatra, 2016), and the current paper with the same words. These words serve as a reminder that while the Generalized Intelligent Framework for Tutoring (GIFT) can seem overwhelming at times, it is a very powerful tool for a research psychologist, and there are guides such as this and previous ones that will help you so that you do not become overwhelmed. The words also reference the fictitious Hitchhiker’s Guide to the Galaxy (Adams, 1979), which had those two words on the cover and sold more copies than any other similar text (due to be reassuring, and slightly cheaper).

The current work does not necessarily replace the previous two guides, but it builds on and updates them, as any good sequel should. GIFT ultimately is a research-based project, and as part of that model the software has been continuously updated. In the current guide, there will be explanations of the software overall, as well as changes that have occurred in GIFT 2017-1, GIFT Cloud, and the upcoming GIFT 2018-1.

WHAT IS THE GENERALIZED INTELLIGENT FRAMEWORK FOR TUTORING?

GIFT is a domain-independent framework for creating intelligent tutoring systems (ITSs) (Sottolare, Brawner, Sinatra & Johnston, 2017). In an ITS, the domain is traditionally highly coupled with the tutor itself. GIFT provides the tools and foundation such that an instructor, researcher, or subject matter expert can bring materials that he or she already has and use it to create new ITSs. If there is overlap between previously created courses or surveys they can be reused in the new course, and the materials (such as PowerPoints or PDFs) can be easily changed out for other existing or created materials. GIFT has been designed primarily for use in creating ITSs, however, it’s other goals include providing functionality to conduct research, and to be used as a testbed.

Research that is conducted with GIFT can take two forms: experiments specifically focused on the applications of intelligent tutoring, which can utilize remediation, and more traditional linear experiments. A general overview of different types of experimentation with GIFT is also available (Sinatra, 2017). The current paper will focus on the latter of these two types of experiments, the traditional linear psychology experiments that do not utilize ITS remediation. One of the strongest features of GIFT is the ability to put a number of materials of different types (e.g., PowerPoints, PDFs, html, images, and surveys) together in a consistent and fluid sequence that does not require intervention from an experimenter to move on from one file type to the next. This reduces the number of research assistants that are needed to run a study, reduces the possibility of human error, and allows for multiple participants to easily be simultaneously run in the experiment.

GIFT provides the tools to create a “course” or sequence items that are displayed in a specified order. To create an experiment with multiple conditions, the original course can be created, and copied. The appropriate changes can then be made to the relevant materials in each of the additional conditions. Once a participant arrives they can be setup on a computer that is running the necessary condition. Or if the study is being done online, they can be provided with a link that is specific to the experimental condition that they were assigned. GIFT provides tools to create the flow of the experiment, hosts/generates online links for cloud based studies, and provides ways for experimenters to extract their data from the experimental sessions.

There are two different versions of GIFT: desktop based and cloud based. The functionality of these two versions of GIFT is very similar, but there are considerations that should occur when deciding between which version of GIFT to use. In the current paper the differences between them will be briefly discussed, but previous Research Psychologist’s Guide papers (Sinatra, 2014; Sinatra, 2016) focused primarily on the desktop based versions. For the purposes of the current paper, the focus will be primarily on the Cloud based implementation of GIFT, and how it can be utilized for experiments.

CREATING AN EXPERIMENT WITH GIFT

An experimenter can author a GIFT course that consists of the different components that he or she wants to present to the participants. As noted above, in order to create multiple conditions, multiple versions of the same course can be created with the appropriate manipulation of interest included in each of them.

GIFT Authoring Tools

The GIFT Authoring Tools are used to create GIFT courses, and have an easy to use drag and drop interface. The Authoring Tools have gone through many iterations and developments through the years, and the interface has been updated significantly since the previous Research Psychologist’s Guide paper (Sinatra, 2016). The current version of the GIFT authoring tools is shown in Figure 1. The left side of the screen has course objects that can be added to the course, and the right side of the screen is a timeline that shows the flow of the GIFT course that is authored. The example in Figure 1 is a subset of one of the conditions of a previous experiment (Sinatra, Sims, Sottolare, 2014). The sequence of items displayed are, introductory text, a survey, information text, an interactive PowerPoint, an information text, a survey, introductory text, a survey, and finally information text. The course continues on and would be visible if the screen was scrolled by the experimenter. Each of these items will be automatically presented the participant in sequence without the need for intervention by a research assistant. In the case of PowerPoint, GIFT connects to the instance of PowerPoint that is on the participant computer and opens/closes it as appropriate.

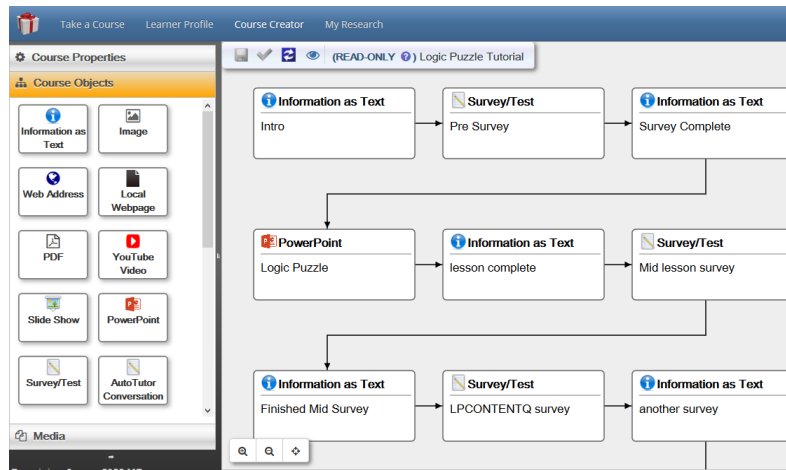


Figure 1. The current version of the GIFT authoring tools.

The structure of the course is created by the experimenter, and can be rearranged as needed. There are a number of “public” courses that are available by default with each new GIFT account. On the main tile login screen of GIFT, instead of clicking to run the course, you can click on “Edit Course” which will open it in the course authoring tool. As demonstrated in Figure 1, the courses may say “Read-Only”, but they can still be opened in the authoring tool and the components, order and configurations can be viewed. If you would like to make changes to these courses you can do so by copying them on the course tile page, and making edits to the copy. These courses are a great place to start in order to get comfortable with how GIFT is set up.

Course Objects

In order to begin authoring a new course, the experimenter can access the Course Authoring Tool from the top menu, and then can drag an item from the left side of the screen onto the timeline on the right side. Each individual item (e.g., “Information as Text”) can then be selected, and configured. The configuration window for each item will appear on the far right side of the screen when a course object from the timeline is selected.

Many of the course objects are straight forward and self-explanatory. For instance, “information as text” allows the experimenter to provide information (such as instructions) that will simply be presented to the participant. A web address, PDF, or local web page can also be used during the course.

An important distinction is made between the Slide Show object and the PowerPoint object. If you have already existing materials in PowerPoint that you would like to use, or you would like to create your informative material with PowerPoint’s interface, you can then use what you created in your GIFT course. The Slide Show object should be used when there is no interaction between the participant and the PowerPoint course itself, and there is no multimedia present in it. The Slide Show object makes individual images of each slide that you upload, and converts it into an easy to navigate slideshow. In order to use it, the original file that is uploaded should be in .pps form (PowerPoint 2003 show form).

One of the advantages of using the Slide Show is that it does not need to open and close the actual PowerPoint program, which means that in the cloud this will run extremely smoothly and not require a connection to be made between the participant’s computer and GIFT. If it is necessary to interact with PowerPoint using macros, Visual Basic for Applications or even to include multimedia such as sounds or videos, then a PowerPoint object needs to be used. In this case, when the individual runs the course in the

cloud it will require downloading and installing a brief java webstart application to connect the PowerPoint software on the computer to GIFT. This can take time and requires that the participant go an extra step. Additionally, it not only requires that the participant have PowerPoint on their computer, but that it is a version that GIFT is compatible with. Therefore, unless the PowerPoint is interactive, or adaption needs to occur during it, the preferred item to use is the Slide Show.

As a note, with the Slide Show item there are navigational arrows at the top of the slides. One button will be to go back a slide (this option can be taken away if the course author wants it to be), to go forward a slide, and to complete the entire Slide Show. It may be helpful to provide instructions to the participants to let them know the difference between the arrow that goes forward a slide, and the one that completes the show so that they do not accidentally exit out of the show.

In the case of both objects, they will require a .pps (2003 PowerPoint show) file, but GIFT will handle them differently. This PowerPoint file is created by selecting “Save As” and scrolling to ‘PowerPoint 1997 – 2003 Show (*.pps)’ in the “Save as type” selection. If a different type of file is used, it will not be able to be uploaded. Additionally, if macros are to be used for a PowerPoint object, the correct version to save is “PowerPoint Macro Enabled Show (*.ppsm)”. PowerPoint objects will require a GIFT compatible version of PowerPoint to be installed on the computer that is being used for participation. The Slide Show Object does not require that PowerPoint be on the computer that is being used. A quick reference table of when it is most advantageous to use each object is displayed in Table 1.

Table 1. Comparison Chart for when to use PowerPoint Objects vs. Slide Show Objects

Requirement	PowerPoint Object	Slide Show Object
PowerPoint with or without images and no interactions		X
Videos or Audio in the PowerPoint Presentation	X	
Visual Basic for Applications or Macros is used	X	
Online presentation of materials on participant’s own computer		X
Assessment or time spent on slides is needed	X	

Survey Authoring

The survey authoring system is a very important tool to a research psychologist. Since the previous version of this guide the survey has system has undergone significant changes and improvements. Usability was the number one focus of the changes, and many of the extraneous details such as setting up survey contexts were removed. However, an important distinction must be made between the Survey/Test object, and the Question Bank object. Additionally, within the Survey/Test object there are three options that can be selected for use when creating a survey. It is important to understand what the functions are of each type of survey to ensure the correct one is authored. Figure 2 provides a display of the three types of options provided when an experimenter pushes “Create New” on the Survey/Test window pane.

Create a New Survey

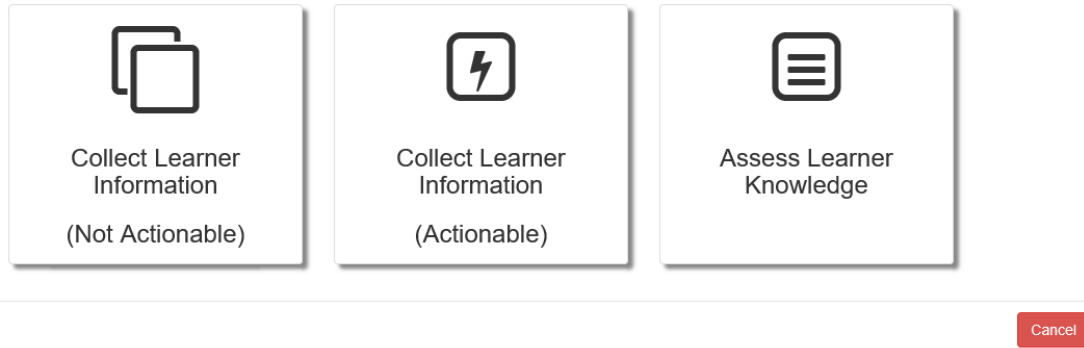


Figure 2. A screenshot of the three types of surveys.

In the case of a demographics survey, in which learner information will be recorded but not be used actively during the experiment the proper selection to use would be “Collect Learner Information”. If the intention was to assess the learner knowledge in the form of a score on a specific series of questions, then the option to select is “assess learner knowledge”. In this case the information will be actively graded during the course, and can be used to make selections about what materials are presented. The survey author also has the ability to note what is considered a novice, journeyman and expert for the specific survey. Figure 3 provides a screenshot example of the “Assess Learner Knowledge” option. Note that the slider at the top of the screen can be used to adjust the percentages correct that are required to be classified in each category.

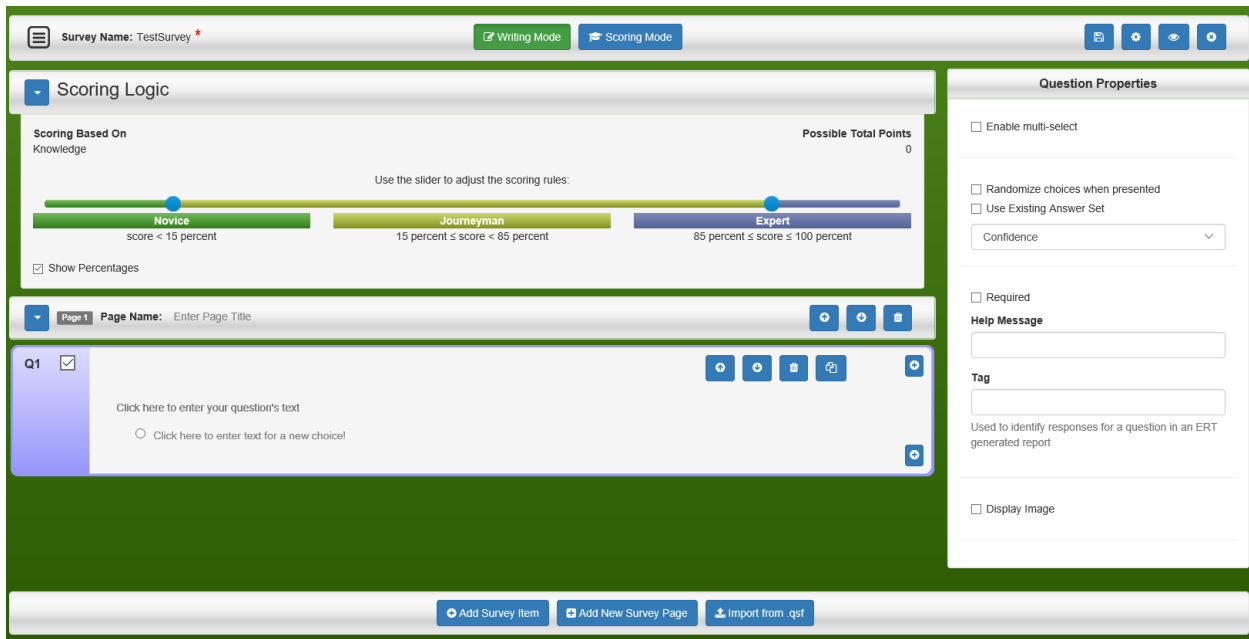


Figure 3. Screenshot of Assess Learner Knowledge Survey type.

Questions are added using the buttons on the bottom of the screen. After question text is added scoring and correct answers can be added by clicking on the “Scoring Mode” button on the top of the screen, which will add some additional features to the interface. The correct answer can be provided by putting a number point value such as 1 for correct and 0 for incorrect next to the options for each question.

The Question Bank object is similar to a survey, but draws on a larger set of questions that have been authored within the course. If an experimenter wants to provide a randomized selection of questions that are associated with specific concepts, he or she may choose to use the question bank. It is also necessary to define course concepts by clicking on the “Course Properties” tab on the main Course Authoring Tool page (this tab can be seen on the left side of the screen in Figure 1). The issue that may be run into when using a question bank in an experiment, is that unless the same number of questions that are authored is selected as the number of questions given, you cannot be sure of what questions will be provided to the participants. Therefore, this functionality is more advantageous for actual team tutors, or experiments in which the questions themselves are being varied. Table 2 provides a quick guide to when to use the Survey/Test Object as opposed to the Question Bank Object. The question bank is also utilized within an adaptive courseflow object, which his beyond the scope of the current paper.

Table 2. Comparison Chart for when to use Survey/Test Object vs. Question Bank Object

Requirement	Survey/Test Object	Question Bank Object
Present questions in a random order		X
Present questions that are associated with concepts		X
Collecting demographics information	X	
Using a questionnaire or measure that requires a specific order of presentation	X	
Not all generated questions are required to be answered		X
Using an assessment that requires all questions to be answered and to be shown in a specific order	X	
Questions will be reused in Adaptive Course Flow object		X

Creating a “Tag” or name for each question is extremely important, as otherwise it will output simply with a number associated with when the question was authored. The place to create the tag is visible on the right side of the screen in Figure 3. Without a tag, it is very difficult to figure out which question response is which. Therefore, when authoring the question be sure to put a short word in the “Tag” box that will let you know what it means so that you can go back later and look at the survey data easily.

EXPERIMENTAL PROCESS

A very important decision that will need to be made is whether the experiment will be run on the cloud or locally on a computer. The way that data is extracted and saved will be different depending on the approach that is used. In the previous guide (Sinatra, 2016) an in-depth explanation is provided about how to use “Experiment Mode” on the local computer. If you wish to use “Experiment Mode” and create experiment specific user IDs, please refer to the previous paper. For the current paper, the approach of “Publishing Courses” and the difference between desktop vs. cloud mode will be discussed.

Publish Course and Participant Management

Once you are happy with the course that you created you will click on “Public Course” at the top of the screen. You will then select the “Publish Course” button on the left side of the screen. This will bring up a screen that allows you to publish the course as an experiment, and add a specific course name and description. At the bottom of this screen you will select the course that you wish to publish. If you have three experimental conditions then you will do this three times, each with a different published course name that will make sense to you the experimenter, and your research assistants. See Figure 4 for a screenshot of the “Publish Course” screen.

Publish Course

Publish Course as:

Experiment LTI ▶ What's this?

Published Course Name:

Condition 1

Description (Optional):

Select Course: Search...

Course Name	Workspace
2 Go Course Branching Final Version - 2 Copy	
Basic Training Study Guide	
Cognitive Psychology	
Cyber Security Mod 1 - Intro to Cyber Security	
Excavator Training (demonstration version)	Public
Go Course Branching Final Version	
Hello World	Public
Hemorrhage Control	Public
Logic Puzzle Tutorial	Public
MyNewCourse1	
RapidMiner Demonstration	Public
Sample of TC3 course	
Science is Zarked	Public

Publish Course Cancel

Figure 4. Screenshot of the Publish Course screen

Once you “publish” a course it makes a copy of the course at the current moment in time. Any changes you make to the original course after this point will not populate into the previously published instance of the course. If you need to make a change you will need to publish the course again, using a different course name. It will be important to make sure that you save any collected participant data, as it will not transfer over to your new published course.

Once you create your course you will get a notice that says “Experiment Created!” and has the URL that you can provide to the participants to access it. If you are using the cloud version of GIFT, this will be a cloud.gifttutoring.org URL. If you are using the desktop version, it will be a local URL that can be pasted into the web browser to bring up the course on your computer without needed the participant to log in to a GIFT account.

Since publishing your course does not require a GIFT account or login, you will need to be sure to clearly provide a participant number to each participant. You will also need to author a survey item at the beginning of your experiment that requires the participant number to be entered. This is extremely important, as it is the only way that you will be able to match up the participant with their specific data.

Extracting Data and Building Reports

Each experiment or published course that you have created can be found and accessed on the “Publish Courses” screen. Active experiments are in green, and paused experiments are in red. Once you have clicked on your current experiment, it will provide you with the URL, number of attempts and last attempt time. The interface to interact with your published course/experiment can be seen in Figure 5. The information below refers to the cloud version of GIFT, however, the process is very similar on the desktop version of GIFT and uses the same tools.

Published Courses: [What's this?](#)

[Publish Course](#) [Create Course](#)

Course Name	Published status
Example Experiment	Paused
TC3 Course 1 - Introduction	Active
TC 3 Course 3 - Phases of Care	Active
Test Course 234324	Active
Cognitive Psych 1	Paused
Testing123	Active
Condition 1	Active

Description
<No description available>

URL

Course
4ac95646-0c44-470d-8d5c-98d2442b30e3/Logic Puzzle Tutorial

Subject Data
Number of Attempts: None
Latest Attempt: N/A

[Pause](#) [Export Raw Data](#) [Pause and Build Report](#)

Figure 5. Published Course interface

Further, it has the options of “Pause”, “Export Raw Data” and “Pause and Build Report”. Each of these are very important functions. “Pause” allows you to temporarily stop collection of data; you might do this if you have collected data from the maximum number of participants that you need. “Export Raw Data” allows you to download the full GIFT log for each participant so that you can later extract it on the desktop version of GIFT. This function is most helpful if you used real-time assessment in a training application like PowerPoint. It is likely that for a straightforward experiment it will not be used. The most important option is “Pause and Build a Report”. This allows you to extract data from the participant logs. If you have simply are interested in the input that participants gave in surveys, then you will select “Survey responses”. In most cases it will be helpful to also click “Merge each participant’s events into a single row”. This will arrange it so that each participant is on a different line in the output spreadsheet, and that the question names are on the top of each column. Once you click create report, it will provide a report for you to download, which can then be opened in Excel to be saved as a spreadsheet, and subsequently SPSS if desired. At this point it is very important that you tagged each question with a name so that you can see which responses belonged to each question for later grading or coding. See Figure 6 for a screenshot of the “Build Report” screen with survey responses selected.

Build Report

Please specify which events from **Condition 1** should be included in this report:

- Frequently reported events
- Training application events
- Other events

Frequently Reported Event Types

- Learner states
- Pedagogical requests
- Performance assessments
- Scenario Adaptation (Environment Control)
- Show Feedback in Training App
- Show Feedback in Tutor
- Survey responses

Merge each participants's events into a single row

Figure 6. Build a Report Screenshot

CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

The current paper provides a guide for research psychologists who would like to use GIFT to conduct traditional psychology experiments. Many changes have occurred over the years in GIFT, and one area that

works, but is not perfected is participant management and the extraction/organization of data after conducting an experiment. Future research and development in GIFT can include updating the data extraction tools to provide more information to researchers, and clearer options. Additionally, while the current implementation of published courses allows for a question to be asked that can gather the participant number, it does not automatically link a number to the session that is visible to the experimenter. It would be helpful to have an alternate method of logging in that did not require creating a new online GIFT account. It would also be helpful to export surveys and questions in a manner that would allow researchers to match up the output questions with the responses that were provided by participants. This is particularly useful in cases when an experimenter may have forgotten to put a tag on the individual question and are unable to figure out what question was being responded to by the participant.

Even though there are still a number of improvements that could make GIFT more useful as a tool for conducting research, it has made great strides over the years. The authoring tool and survey system user interfaces have been greatly improved since the original version of this guide was created, and there are many more tools and features that are available to researchers. It is expected that GIFT will continue to develop and become an even more powerful tool for research psychologists and others to leverage to conduct experiments.

REFERENCES

- Adams, D. (1979). *The hitchhiker's guide to the galaxy*. New York: Pocket Books.
- Sinatra, A. M. (2014). The research psychologist's guide to GIFT. In *Proceedings of the 2nd Annual GIFT Users Symposium*, 85 – 92.
- Sinatra, A. M. (2016). The Updated Research Psychologist's Guide to GIFT. In *Generalized Intelligent Framework for Tutoring (GIFT) Users Symposium (GIFTSym4)*, 135 – 144.
- Sinatra, A.M. (2017). Utilizing intelligent tutoring systems and the Generalized Intelligent Framework for Tutoring (GIFT) for research. Proceedings of the *International Defense and Homeland Security Simulation Workshop 2017*, 18 – 24.
- Sinatra, A. M., Sims, V. K., & Sottolare, R. A. (2014). *The Impact of Need for Cognition and Self-Reference on Tutoring a Deductive Reasoning Skill* (No. ARL-TR-6961). ARMY RESEARCH LAB ABERDEEN PROVING GROUND MD.
- Sottolare, R. A., Brawner, K. W., Sinatra, A. M., & Johnston, J. H. (2017). An updated concept for a Generalized Intelligent Framework for Tutoring (GIFT). *GIFTtutoring.org*.

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