Time Engineers Software

(Software review)

***Reviewer*:**
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Product details:	
Product Name:	Time Engineers
Product Category:	Educational
Developer/Publisher:	Ray Shingler and Valparaiso Unviersity
Website	http://www.timeengineers.com/
Target group	Middle and high school students grade 5th through 9th (13-17 year old)
Product Price:	US$20 personal, US$500 class, US$1,200 District.
Contact:	Ray Shingler
Snapshot review:	(Max 5)
Ease of use	4
Ease of navigation	4
Documentation	4
Price/value ratio	3
Pedagogical foundation	4
Instructional value	3

Brief product overview

Time Engineers as supplied contained a spiral bound book with a teacher manual, lesson plans, two CD-ROMs (one with the software and the second with PDF files of the documentation) and a set of transparencies.

Minimum system requirements:

- Windows 95
- 166 MHz Pentium processor
- 24 MB RAM
- 2 x CD-Rom drive
- Sound card (will work without but some instructions for tasks only given as audio files)
- Screen resolution: All images rendered for 640 x 480, (works fine at higher – tested using 1024 x 768)

- Installation
  - Three options, run from CD, CD-Rom Play with Support files for classroom and home use installed on hard drive (6.8MB) and Full installation takes 620 MB.
- De-installation
  - This is achieved via an uninstall option and was very straightforward. No obvious residual files were left on the hard disk.
- Costs (http://www.timeengineers.com/purchase_e-commerce.html). As at 28 March, 2005 the following options were available (I have rounded them up). Purchasing can be made on-line.

US$20	Home Edition	single CD
US$60	Single User Teacher edition	Guide + CDs
US$200	5 user Lab Pack	Guide + CDs
US$300	10 user lab pack	Guide + CDs
US$500	25 user lab pack	Guide + CDs
US$600	75 user lab pack	2 x Guides + CDs
US$1,200	School District Unlimited License	2 x Guides + CDs

Using the system

The system can either be installed completely on a Hard Drive or be run from the CD-ROM. A brief splash screen introducing Time engineers leads to an introductory screen shown in *Figure 1*.

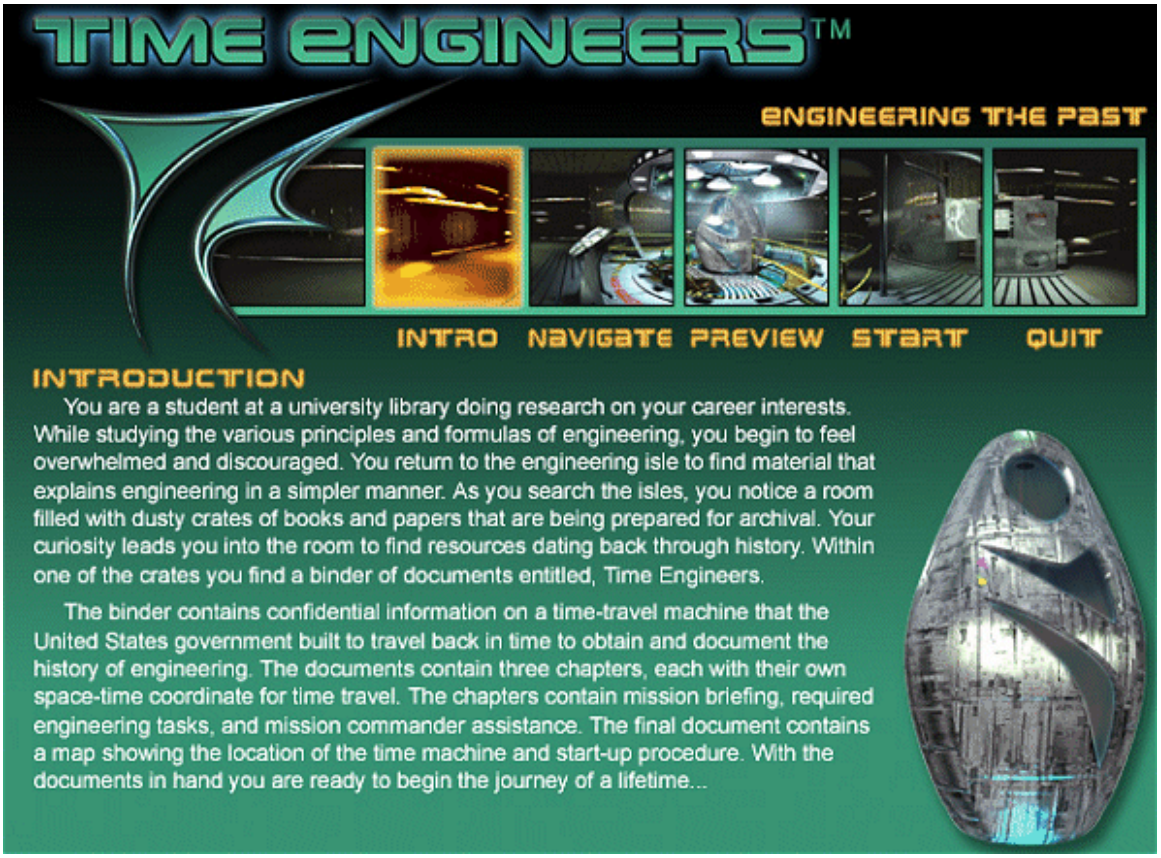

Figure 1. Introduction Screen

The **Navigate** option describes the techniques used to move around time engineers, while the **Preview** gives a quick video sequence to introduce Time Engineers.

Figure 2. Library Desk with career information

Selecting **Start**, takes you to a desk in a library (*Figure 2*). Clicking on the open books describes various engineering occupations (Civil, Electrical and Mechanical). The center pad gives a list of courses a student should consider if they wish to pursue a career in engineering. Selecting the arrow begins the journey with the first task to find the time pod. Successive scenes follow by clicking on the navigation arrows (*Figure 3*). Occasionally multiple direction arrows are displayed. If the wrong path is taken, you take a detour, but are always redirected onto the correct path.

Figure 3. Navigation from library to binary lock

An arrow with "*Interactive*" indicates that the next scene will either be a movie or require some user interaction. Apart from using the menu options displayed at the top of the screen, there does not appear to be any way to go back one step.

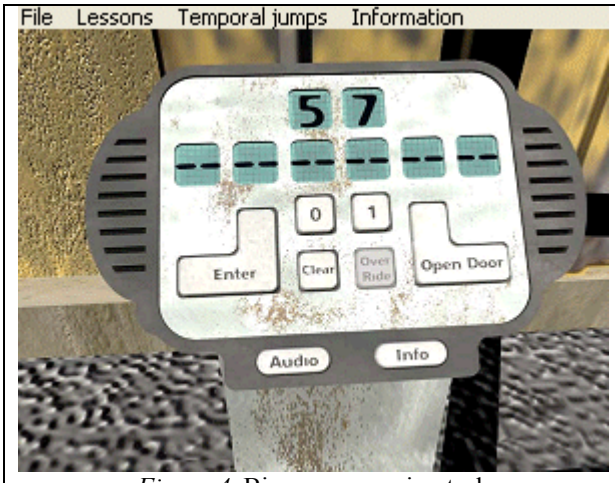

Figure 4. Binary conversion task

Eventually you are confronted with a panel where 57 needs to be converted into a binary number (*Figure 4*). After three incorrect tries a student can use the override button. 57 is the only number to convert. Once achieved, a further navigation sequence takes you to the next task which is to provide power to the time pod. This task involves turning on switches using Boolean algebra (AND, OR, NOT). Once the system is powered up, the next navigation sequence takes you to controls for the time pod.

Figure 5. Time pod control

A time period is selected (left of radar screen), then by clicking the buttons in the sequence directed, the time pod is powered up.
Once all the buttons are pressed, the audio command "Enter time pod" is heard and the green button [Enter] flashes. It seems like you have to click the button to proceed (which I did many times!), but actually the sequence is automatic.
To get to Egypt the first time took approximately 20 minutes.

An animated sequence follows where the time pod is activated and passes through a time vortex, arriving in Egypt. Once the pod is locked a selection panel allows you to choose from two tasks. One of the tasks is to decide on the amount of water required to irrigate a field by adjusting the water flow. This is illustrated in *Figure 6*.

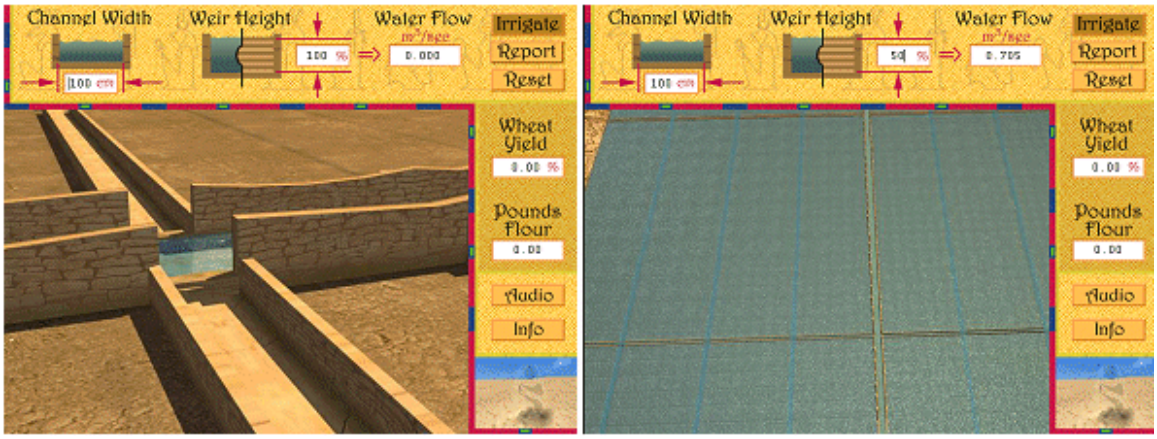

Figure 6. Weirs and water flow

Clicking [**Irrigate**] allows you to see how well you have done. In *Figure 6* I have over irrigated and the fields are flooded (I did manage a 97.74% yield but won't give the answer away in this review!). Once the task is complete, the second Egyptian task is to add a layer to a pyramid (*Figure 7*).

Figure 7. Building a layer in a pyramid

Here the goal is to estimate the ramp angle and workers required to build a layer of a pyramid. Unfortunately a problem with this task is that the final target was not clear.

There are three "Temporal Jumps" Giza Egypt 2560 BC, London England 1940 and Angers, France 1238.

Tasks in London England 1940 are illustrated in *Figure 8*, and involve techniques for Electrical Engineering.

Figure 8. England 1940

A submarine task was displayed (*Figure 8*, left). Without reading the instructions it was not immediately clear what to do. Clicking the throttle button which at the time seemed the logical thing to do started a fairly long automatic simulation with audio indicating what was going on, but little in the way of graphics. The simulation could improve by checking to see whether any changes had occurred, and possibly providing more interactive scenes. Basically what was required is to set three variables; power, engines and motor HP, and a simulation voyage of the submarine going from the US to England and how well the U-Boats were avoided occurs. After setting the switches and crossing the Atlantic I felt I didn't really understand what happened.

The second task was to manipulate some settings on 5 radars. An audio simulation similar to that of the submarine, of planes being shot down with some ending video sequences followed. Even though the simulation indicated I had successfully saved London - in spite of 3 radars being destroyed - I did not feel I had been successful, yet was directed away from the radar station, and back to the time machine!

The third temporal jump was to Angers, France in 1238, (*Figure 9*), and involve techniques for Mechanical Engineering.

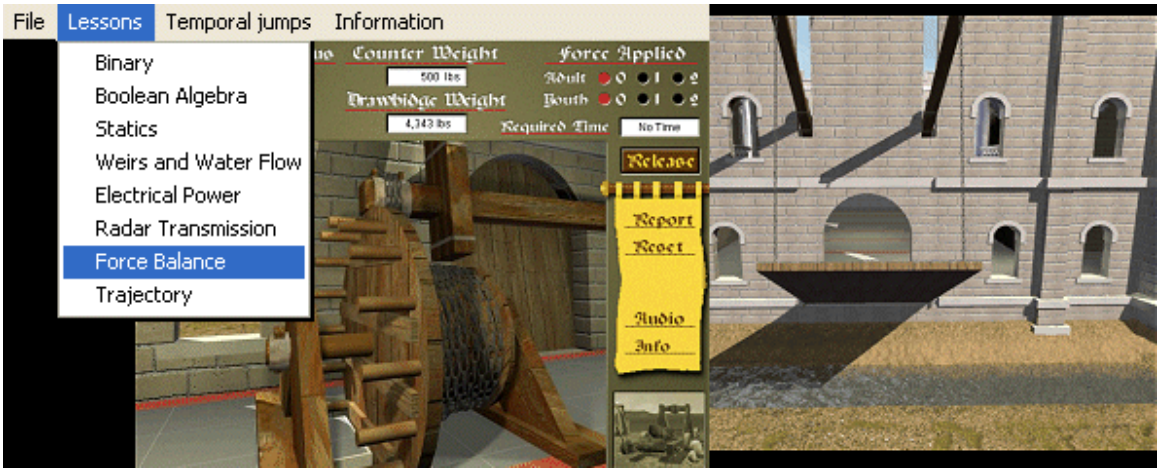

Figure 9. Drawbridge task

Probably the most visually appealing task was the Drawbridge. The task required setting weights and counterbalances to open and close the drawbridge. Unlike other simulations, different animations were displayed

dependant on the settings. It was good to see for example the drawbridge structure break when the forces were too great! In this case, the task had to be completed before the system allowed you to proceed.

The final task is a catapult. It was good to find in this task that the distance varies each time it is performed.

Observations

As shown in *Figure 9*, students are able to resume from where they left off using either the lessons selection (shown) or the Temporal jumps.

The tasks can be completed without understanding the actual mathematics or physics involved, and in most cases can be completed using iterative guesswork. The level of mathematics and physics described in the information is at a senior high school level.
Figure 10, shows some of the formulae involved, Q = the weir water flow rate formula, and P_{req} = pulling force required, and W_{spring} = work done by a spring.

$$Q = \left[0.40 + 0.05\frac{H}{P}\right] HL\sqrt{2gH}$$

$$P_{req} = W\sin(\alpha) + \mu_s W\cos(\alpha)$$

$$W_{spring} = \int_{-L}^{0} \vec{F}_{spring} d\vec{x} = \int_{-L}^{0} (-kx)dx = \frac{-kx^2}{2}\Bigg|_{-L}^{0} = \frac{kL^2}{2}$$

Figure 10. Sample formulae

Main features and strong points

- The main feature is that it provides an introduction to Engineering.
- Educational Edition comes complete with a hardcopy and softcopy (CD) Guide, that includes lesson plans and overhead transparencies.
- Quality 3D animated sequences (actually short video clips) play throughout giving a realistic transition between scenes.
- The measurements and units were appropriate to the time period, giving a historical perspective to the tasks
- The tasks could be completed without understanding the underlying mathematics or physics, giving it appeal to a younger audience.
- Information included some sophisticated formulae to give some indication as to what needs to be learnt in the specific areas targeted by the tasks.
- Contact with the author was straightforward and replies to any queries were received promptly.

Criticism and suggestions

From a teaching perspective, few of the problems vary, so if one student solves the task the answer can given to others. It would have been nice to have had a little more variation in some tasks, such as the binary task.

There was some inconsistency in the navigation. For example, in the pyramid task, clicking on the time-pod button takes you forward , whether or not you have solved the task, whereas the drawbridge needs to be solved before you can proceed to the time-pod.

Scroll boxes need to be set to the top. This is a common problem with applications written in Director. Also the [Esc] button quits the entire presentation. A screen "Are you sure you want to exit?" would be useful.

My personal opinion is that the price for class set of 25 (US$500) is a little too high, given the financial constraints placed on many educational institutions. Otherwise the personal and unrestricted copies seem to be reasonably priced.

From a user perspective the World War 2 tasks could be improved, with audio the main simulation interface. Also some indication as to the goal of the task in the pyramid layer building would be useful. The drawbridge simulations were excellent.

Conclusion

The system achieves its objective of introducing engineering and its application to students. The user interface has clear, quality graphics and navigation is intuitive. Images are of a high quality, as should be evident from the screen shots displayed in this review, and a large amount of time has obviously been spent making them clear and look realistic.

Most of the tasks can be completed by guesswork but there is supporting information that discusses that the mathematics and physics behind the simulation. A little more "randomness" would enhance the reusability of the tasks.

Overall, it introduces students to the various branches of engineering in an interesting and enjoyable way.