

What Is A Digital Textbook

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In the age of «webization» of almost everything, everybody is expecting that somebody will produce digital textbooks for important subjects since apparently anybody can do it. However, everybody gets surprised realizing that nobody did it. At least not in the form expected. Putting on the web page the digital form of otherwise printed document is not exactly what everyone expects. Multimedia is a big (buzz)word but educational content found on Internet looks more like demo fro multimedia tools then like a usable digital textbook. What is a digital textbook, anyway?

This paper is identifying the needs of a student, analyzing the available technology, pinpointing the problems and offering some suggestions what needs to be done in order to create much expected digital textbook of some quality.

It would be unreasonable to expect that any single (text)book could satisfy all needs of a student and the same need for all kinds of students.

A student/user can have different reasons, aims and needs when starting a learning journey. Different people with the same learning goal do have different needs in the process because of their learning styles, habits, abilities and life and work circumstances.

The sole purpose of a textbook can be anything of and between:

- to introduce: the new idea, field, technology or possibility.
- to explain: whys and hows.
- to teach: how to use, implement, utilize new knowledge or skill
- to verify: newly acquired knowledge or skill or the level of remained knowledge/skill.
- to assist: in every day's application of gained knowledge/skill. Starting from this, it becomes clear that there are different kinds of textbook. Even if they come in one package it is a combination of quite different teaching materials.

A tutorial material has the role to introduce the student to the field of problem. It should explain the purpose of the “whole thing” as well as to describe an idea or foundations of solution/technology. From this point on the possibilities and applications should be clear to the user.

Probably the best way to accomplish this task is by story telling. There is nothing better than live presence of a master of story telling. However, very appealing and easy to use form is a video (documentary). It's narrative form, combined with professional dramaturgy should keep the audience attention at it's peek during the 20 to 30 minutes.

Recorded (live) lectures are NOT good as tutorial substitute. They should only be used as “better than nothing” solution if video is not available, and student cannot be present at the live tutorial.

A student needs (good) tutorial only once in the lifetime. He might use it again if he did not take a walk on that learning alley for whatever the reason or revert to it sometime later in order to reflect on some alternative views at the matter.

However, the fact is that tutorial is seldom used by the same student and that makes it relatively very expensive.

After getting the main idea, the student needs to understand “mechanics”: how do things work, why do they work in such a way, how are they used, what are the benefits and tradeoffs.

They need to be explained in very short, interactive steps. “Interactive” means every explanation should be followed by an example/demonstration and immediate question(s) to student. Depending on the answers from the student, explanations should be repeated, broadened, reiterated until full understanding is accomplished. Likewise, explanations should be accelerated, if student is “quick” on “getting it”, to prevent boredom and loss of attention.

This type of a textbook is typically used once on the beginning of the learning process, much later, after long time of passiveness, i.e. not using this particular knowledge or skill.

However, depending on the results in the next phase of the learning process, exercise, student might be instructed to return to explanation phase in general or to a specific point.

After explanation, everybody has the feeling she/he has “got it”. However, in order to fully grasp it, one needs to implement the new knowledge/skill in an organized and ordered way, one needs to exercise under supervision.

The purpose of this phase is to fortify the new knowledge/skill through rehearsal process thus achieving the required skill level in applying the knowledge/skill.

Student needs to be presented with challenges of progressive complexity. Student’s results need to be automatically verified (not to wait for an instructor to judge) and complexity of next challenge automatically adjusted to that result. The mechanism should use, and student should be informed about her progress based on statistics of all previous students. In the case that some basic understanding is missing, student should be referred to the appropriate point in the explanation phase.

This type of material is intensively used both, during the initial training but also later, each time skill need to be refreshed or improved. Therefore this learning tool should offer clearly different levels of mastery: from the novice to the super master.

Once the student reaches the level of operationally applicable knowledge and skill she will need help and assistance in utilizing it in her work and life. The initial aim is to understand principle and become capable of applying them, not to memorize a huge number of operational details.

However, those details are necessary for real application. Therefore the user needs a variety of materials like: reminders, quick reference, overviews (of functions and parameters).

They come in from of glossaries, lexicons, lookups, guides, quick reference cards, charts etc.

They are frequently used but the pattern and form of usage does change as the user's skill mature and self-confidence rises as well as tasks undertaken do evolve.

Specific types of knowledge and skills, especially connected with tools and devices and in complex environments do call for shortcuts and guides to be at user's disposal.

A sort of cookbook is always handy if novice needs to apply new knowledge quickly in complex situation.

They should come in from of step-by-step guide, charts, diagrams, checklists, photo-story and similar.

They are very frequently used at the beginning of usage and later for less frequently used, specific and very complex situations.

During the whole learning process, interactive teaching tools need to assess the current level of student's knowledge and skills. For the motivation purposes, the student himself needs to be presented with his progress status. Finally, students, schools, (future) employers and the investors in student's learning activity want to be presented with a certification of newly acquired (or already existing) knowledge and/or skill.

While some purposes and phases could tolerate assessment by human being, other require immediate and fast assessment. All this calls for development of automated knowledge and skills assessment tools.

They should verify possession and understanding of knowledge, verify skills and compare them with statistics (of previous students taking exam).

They should use all appropriate forms like: quiz, test, puzzle, virtual lab assignment etc. They should use large database of questions and vary parts of questions (variables) according to preprogrammed algorithm.

This type of tools would be used during the learning process, at the end of the teaching/learning cycle and will be repeated whenever a renewal or improvement of skills is required.

The conclusion can be drawn on three topics: requirements towards teaching/learning materials, authors and resources they need.

Regarding requirements of users/students it seems obvious that different types of materials are needed that will be used by different users, in different times and for different purposes.

They need to be interactive meaning they should allow the user to do: STOP, REW, FF, SEEK, search and bookmark specific information or part of learning process. They also need to be adjustable to student's needs, learning style and speed.

Above all they need to be enchanting! The learning process has to be enjoyable experience. This does not mean advocating that it should be easy and sweat-less. It simply means that during the whole process student should be aware of the overall and immediate goal, have multiple resources to aid her in this process, be able to check on her own progress in every moment and that challenges be chosen in such a way that the whole effort has a meaningful purpose to the specific student.

Regarding authors of digital textbooks, it is clear that individuals who will be able to perform all required tasks are rare if they exist at all. Multiple authors are expected,

instead. Multidisciplinary is the keyword meaning that besides the domain knowledge (the thing we are trying to teach/learn) other specific knowledge/skills are required like: multimedia technology, dramaturgy of multimedia, psychology of learning, quiz and test development.

Thus it is expected that the really useful digital teaching/learning materials can be only developed by teams of experts.

These multidisciplinary teams will need significant resources to accomplish their task. They will need support in development in areas of (visual) design, programming, and performing arts to name the few. They will also need a large database of multimedia clips, possibly royalty free, to enrich their presentations and explanations, as well as general-purpose virtual laboratories or remotely controlled real laboratories. They will also need large, well-connected multimedia-on-demand servers to store and present their products.

Of course, all this will also require significant financial support.

In conclusion, it is very unlikely that high class products can “happen” without organized and institutional support on the level of university or on the national level.