

## 遠距教學與數位學習-奈米科學

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### 摘要

奈米尺度大約是指 1 到 100 奈米的範圍，奈米科學具有獨樹一格的現象是新型態之應用和控制物質。一奈米是一公尺的十億分之一，一張紙的厚度大約是 10 萬奈米。涵蓋奈米科學，工程和技術，奈米科學涉及在奈米尺度的成像，測量，建模和操縱物質。奈米是一個快速發展的研究領域，它坐在幾個學科的收斂點-物理學、化學、生物、機械等。本篇論文實際的導向旨在提供學生和研究人員，兩個重要的具體特點，包含工具製造和奈米尺度的特徵以及科技應用中最活躍的領域-電子學、磁學、生物學、信息存儲等。具體的應用和技術包括奈米光刻技術，STM 和原子力顯微鏡(AFM)，奈米線和超分子，分子電子學、光電子學和模擬等，各個部分的工業應用和未來的發展相當的重要。本論文說明以遠距教學與數位學習“奈米科學”，上課方式將以「線上學習」來進行教學。課程主要以「數位教材設計-分析」內容中的「教學設計模式簡介」和「分析工作簡介」為主。數位教材開發過程中，「分析、設計、發展、建置、評鑑」五個階段的工作項目。分析的工作項目有：學習者、學習環境、現有資源、媒體、成本、目標和架構分析。提供教師（助教）、學生必要之學習管理系統功能，和最新消息發佈、瀏覽。期末並且實施形成性評量(formative testing)，形成性評量不列入學習成績，僅提供學生學習成效是否已形成了的參考而已。

**關鍵詞：**奈米科學，遠距教學，數位學習，數位教材，形成性評量

## The Distance Education and e-Learning of Nanoscience

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### ABSTRACT

Nanoscience is the understanding and control of matter at dimensions of roughly 1 to 100 nanometers, where unique phenomena enable novel applications. A nanometer is one-billionth of a meter, a sheet of paper is about 100,000 nanometers thick. Encompassing nanoscale science, engineering and technology, nanotechnology involves imaging, measuring, modeling, and manipulating matter at this length scale. Nanoscience is a fast-developing field of research, which sit at the point of convergence of several disciplines (physics, chemistry, biology, mechanics, etc.). This practically-oriented overview is designed to provide students and researchers with essential information on both the tools of manufacture and specific features of the nanometric scale, as well as

applications within the most active fields (electronics, magnetism, information storage, biology). Specific applications and techniques covered include nanolithography, STM and AFM, nanowires and supramolecules, molecular electronics, optonics, and simulation. Each section of the paper devotes considerable space to industrial applications and prospective developments. This paper describes the distance education and e-Learning of "Nanoscience", and the course will be "online learning" teaching. The course introduce "The Digital textbook design and analysis" and about content in "instructional design model" and mainly on analysis of the work. Digital e-Learning development process, including the work of five stages: analysis, design, development, implementation, and evaluation project. The analysis of the work of the project consisted of learners, learning environment, available resources, media, cost, objectives and framework for analysis. Provide teachers and students in online testing, publish, learning information, interactive learning design in chat rooms. And to provide teachers and students presented a variety of teaching activities and other related functions. End of the semester and implement the formative testing, formative testing is not included in achievement of the course, but only providing students learning outcome and reference.

**Key Words:** Nanoscience, distance education, e-Learning, digital teaching materials, formative testing

## I · Introduction

This paper can provide students with remote learning opportunities by StreamAuthor, digital editing software, with a digital video recorder, sound card, graphics card, high-speed CPU and other equipment. We can record and produce the course of classroom instruction, the sound result is microphone and two-in-one content of recording and producing the sound result and having a class of the earphone. The present paper mainly flow master to manufacture by the string, matches several editing software and several video cassette recorders, may record the classroom instruction process, sound effect is the microphone adds the content that the earphone two-in-one record sound effect and attended class. The computer equipment is mainly as follows: CPU is the AMD 640 four cores, RAM is DDR3-1333 4GB\*4, the indicator is the AMD over 4250 ranks is good, may cause several teaching materials and movies obtains the quick editing and extension grade and the compression effect. If joins to transfer the grade, interlude, animation and special video and music effect...Waits for the special effect, then higher-speed computer hardware and peripheral equipment is necessary [1][2].

## II · e-Learning and Distance Education

Introduction to Nanometer

The definition of the nanometer:

The nanometer word derived from the Latin - short stature. One nanometer (nm ; nanometer) is 1 billionth of a meter , one (  $1 \text{ nm} = 10^{-9} \text{ m}$  ) .

Newton magazine indicated: "meter" compared with "nanometer" size is equivalent to the diameter of the Earth and the Earth on a glass marbles (diameter 1.3cm).

The definition of the nanoscale:

1. Macroscopic world - scale greater than 1 micrometer.
2. Microscopic world - the scale of less than 0.1 nm.
3. The mesoscopic world - between macroscopic and microscopic.
4. Nanotechnology means the scale of 0.1 to 100 nm.

The concept of nanotechnology:

Nanotechnology (NANOST) - simple terms, is the manipulation of individual atoms to create a special molecular structure of the new material technology.

Contains - nano physics, nanomaterials, nano-optoelectronics, nano- chemistry, nano - mechatronics, nano-biology, nano- medicine and nano processing technology.

The nanostructures special phenomenon: self-cleaning function of lotus effect

The lotus surface has superhydrophobic characteristics (as shown in Figure 1).

That is why lotus leaf itself has a self-cleaning function of the self-cleaning react to the general called lotus effect (as shown in Figures 2 and 3).

### III · Results and Discussion

3.1 Figure 1 is StreamAuthor joined “Introduction to Nanotechnology” to the slides, the slides one by one to join the digital teaching materials.

Figure 2 is StreamAuthor joined “Introduction to Nanotechnology” to video and audio effects, special effects for video and audio on the right.

Figure 3 is StreamAuthor joined “Introduction to Nanotechnology” to film, digital video recording and editing on the right after the movie.

Figure 4 is example of the StreamAuthor joined “Introduction to Nanotechnology” to copyright, copyright and the year of publication could be added on the right.

Figure 5 is example of the StreamAuthor joined “Introduction to Nanotechnology” to the file conversion and compression process, the computer is equipped with the best use of high efficiency to save the file conversion time.

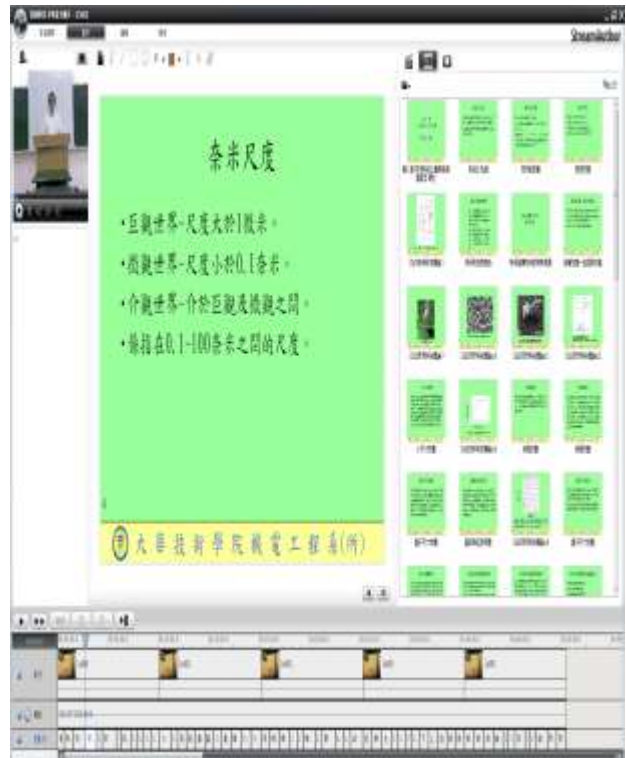


Figure 1 StreamAuthor joined “Introduction to Nanotechnology” to the slides.



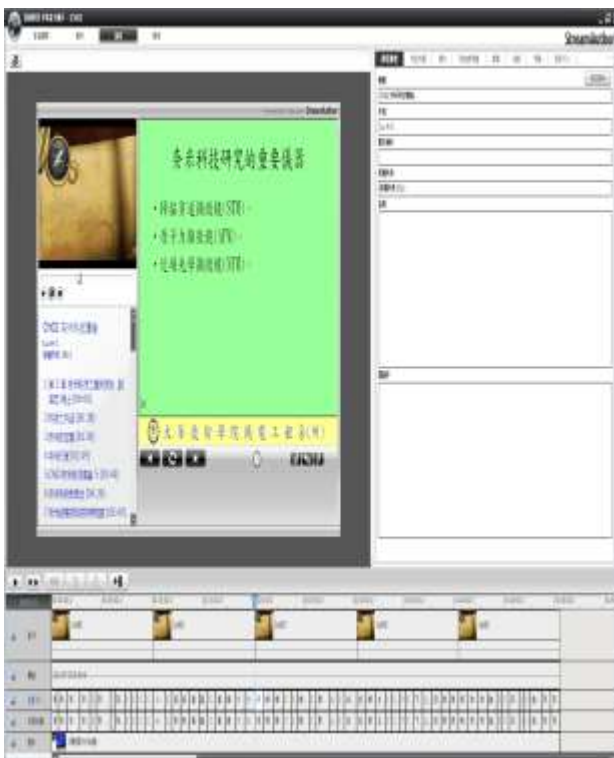
Figure 2 StreamAuthor joined “Introduction to Nanotechnology” to video and audio effects.



**Figure 3** StreamAuthor joined “Introduction to Nanotechnology” to film, digital video recording and editing on the right after the movie.



**Figure 5** Example of the StreamAuthor joined “Introduction to Nanotechnology” to the file conversion and compression process, the computer is equipped with the best use of high efficiency to save the file conversion time.



**Figure 4** Example of the StreamAuthor joined “Introduction to Nanotechnology” to copyright, copyright and the year of publication could be added on the right.

#### IV、Conclusions

This research project StreamAuthor production, with digital editing software and digital video recorders, classroom teaching process can be recorded to the following conclusions:

- (1) Via the proper operation of synchronous online classroom, teacher-student interaction can have a certain degree of brilliant.
- (2) Classroom management activities can be referenced to the business strategy of the synchronous online classroom.
- (3) Synchronous mode of operation and asynchronous operating well with some differences, but its combination of online learning allows more learning attractive and quality assurance.
- (4) Online synchronization group discussions with certain execution mode must be standardized, so that the students online is not positive enough.
- (5) Online synchronization operations are also some tricks, can guarantee the teacher teaching has a certain quality of interaction for students to learn with a certain degree of participation.

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