
AC 2012-3535: ENHANCING GRADUATE ONLINE PROGRAMS BY USING DIGITAL LIBRARY SERVICES

Dr. Vladimir Genis, Drexel University

Vladimir Genis, a professor and Engineering Technology Program Director in the School of Technology and Professional Studies, Drexel University, has developed and taught graduate and undergraduate courses in physics, electronics, nanotechnology, biomedical engineering, nondestructive testing, and acoustics. His research interests include ultrasound wave propagation and scattering, ultrasound imaging, nondestructive testing, electronic instrumentation, piezoelectric transducers, and engineering education. Results of his research work were published in scientific journals and presented at the national and international conferences. Genis has five U.S. patents.

Mr. Jay J. Bhatt, Drexel University

Jay Bhatt received M.S. in library and information science and M.S. in electrical and computer engineering from Drexel University. Some of his interest areas include collection development in engineering, outreach to faculty and students, and teaching engineering information research skills to faculty and students. He is the the 2010 recipient of the Homer I. Bernhardt Distinguished Service Award from ASEE's Engineering Libraries Division and the 2003 recipient of Drexel University's Harold Myers Distinguished Service Award.

Shawn A. Woodson, Drexel University

Shawn A. Woodson is the Assistant for Library Academic Partnerships at Drexel University. He holds a B.S. in production technology from Radford University, and he is currently a graduate student at the College of Information Science and Technology at Drexel University. He is Vice President of the Student Chapter of the American Libraries Association (SCALA - Drexel Chapter), and he is an active member of the Pennsylvania Library Association and the Association of College and Research Libraries.

Enhancing graduate online programs by using digital library services

Abstract

The Master of Science in Engineering Technology (MSET) program was developed at Drexel University to provide a graduate level educational opportunity on a full- or part-time basis. The program is designed to be extremely flexible; it permits the student to select a combination of courses relevant to individual career goals in technology or to provide the foundation for further advanced study. The multidisciplinary curriculum includes core courses and electives in such areas as rapid prototyping, programmable devices and systems, modern energy conversion technologies, lean manufacturing principles, project management, to name a few. The program is currently available entirely online and several of the courses employ web-based laboratory exercises. Through collaboration with Drexel University Libraries, online instructional sessions are planned, designed, and executed. These include: developing quality information seeking and research skills, keeping current with new research, and efficient management of quality references. With technologies available such as Web Conferencing, Chat Reference or Instant Messaging, Email Reference, Course Management System Integration, Blogs, Text Messaging and Telephone service, distance learners receive necessary assistance needed for their projects and assignments through virtual environments. This also helps them discover a variety of information resources available through the Libraries' website which otherwise they would not have known since they do not come to campus. The information skills learned during the process contribute to life-long learning among the students in this new online program. Assessments mechanisms are envisioned to measure students acquired information skills.

Introduction

The Master of Science in Engineering Technology (MSET) program started in the fall quarter of the 2010-2011 academic year (AY)¹. The primary goal of the MSET is to develop advanced level practitioners in industry who are interested in:

- developing marketable skills to meet evolving workforce demands
- seeking professional development
- expanding opportunities for professional advancement
- pursuing a managerial position

The MSET program provides a graduate level educational opportunity on a full- or part-time basis to those who have earned a bachelor's degree in engineering technology or in a related discipline from any college or university of recognized standing. The flexible program permits the student to select a combination of courses relevant to individual career goals in technology or to provide the foundation for further advanced study. Both thesis and non-thesis (applied project) options are available. A final oral exam is required for both the thesis and non-thesis options. The graduate students' advisory committee is represented by a faculty from each related area.

Program's Description

The MSET degree is intended to be a terminal professional technology degree. This graduate program uses a professional, multi-disciplinary, team- and project-oriented approach to graduate education. It focuses primarily on the applied aspects of the technological spectrum related to product improvement, industrial practices, and engineering technology operation functions. It meets the need of graduate students who want to expand their knowledge in advanced engineering technology courses. It also provides the flexibility for graduate students to expand their knowledge in a specific technical specialty.

The MSET program meets the needs of the state-of-the-art industrial environments and it is distinct from most graduate Engineering Management and Engineering programs. Specifically, the MSET program offers courses focused on the technologies used in today's modern emerging industries. The MSET program continues the Drexel's long tradition of providing flexible, customized programs for working professionals, drawing on the strengths of the faculty and core curricular interests. Currently, the program is available only online. In the future, courses will be delivered in several modes, including face-to-face, on-line, and real-time videoconferencing.

Drexel provides students with around-the-clock Internet access. Various university resources, laptops, tablets, and smart phones are utilized by the students for accessing information, communicating with instructors, submitting home works and exams, and obtaining additional information. Specific information about resources and services is described in detail below.

Students' Need for Information Research Skills

As new academic research initiatives become increasingly interdisciplinary, it is imperative that science and engineering librarians develop and implement new approaches to the dissemination of library research tools and techniques. MSET program is expected to prepare students in various subject areas, such as Materials Properties, Computer Applications, Networking, Quality Control, and Production Processes, among other subject areas. Problem solving and applications of scientific and technical knowledge is one of the key areas addressed in the new MSET curriculum. Students need to use different types of handbooks and encyclopedias in order to develop relevant subject background. Many such online resources are available through the University Libraries' website. New technologies that help students discover a variety of online resources are presented in this paper. Online electronic book collections, such as ENGnetBASE and Knovel (both provide access to online engineering and engineering technology books), are uniquely positioned to assist students to learn advanced skills in those subject areas. In addition, alerting services regarding new developments in particular technological fields are available from electronic databases, such as ASCE, IEEE Xplore, Web of Knowledge, ScienceDirect and Engineering Village.

Available Electronic Recourses

MSET students can use the Internet for various school-related reasons. All of them have computing facilities as well as an Internet connection at home. The most common types of sites visited for school related reasons are databases, such as library catalogues and databases with

journal articles or books. Online library resources are an integral part of the research and educational process for students. After doing preliminary research, students turn to online library databases. They should clearly understand the difference between an online database and a website. Benefits of using electronic resources are multifold. Students indicated important advantages of using electronic resources, such as that information is available 24/7 and the ability to work from any location. Electronic resources also result in students obtaining more state-of-the-art diverse information upon request. The Internet is used by the students for many things, such as to look up information on events, get directions or telephone numbers, and get access to Drexel's digital resources. It is worth mentioning that Drexel uses high-speed wide-band Internet2 services, which allows for obtaining large volumes of information in a very short period of time.

Collaboration between faculty and librarians with graduate students is vital in developing information research and educational skills². Developing new communication channels among librarians and users was perceived critical but difficult because of the advent of new technologies while "informal relationships" with librarians was cited as a source of information by students³. It was also pointed out that the assumption that graduate students do not need library instruction and orientation was ungrounded³. Needs for providing information research and educational skills to graduate students through librarian workshops was highlighted by Rempel and Davidson⁴. With online programs, it becomes necessary to think about virtual ways in which these information-related skills can be imparted. For example, Skype, a web conferencing tool, was indicated as a means of reaching out to graduate students. Skype appears to be extremely appealing for librarians to conduct instructional sessions for online students^{5,6}. The need for access to digital and electronic information for off-campus graduate students was termed crucial and critical². Other means of imparting information skills were highlighted by Kilzer, Milliken, and Bhatt⁷. York and Vance recommended that librarians work together with faculty members and embed themselves in online courses offered at their institutions⁸. Hensley and Miller reported that the libraries need to proactively communicate with online students to build awareness of various information services and resources available to them.

While the rise of electronic resources has been a great aid to the academic research community, it has significantly complicated the process for students of selecting and using resources for academic research. Access to information, especially amongst the populations of developed nations, is rapidly become a non-issue. Academic librarians now play a vital role in assisting patrons with organizing and assessing immense amounts of data that exists in the digital world of electronic resources. A great deal of students view this process as an immense barrier to obtaining viable and scholarly information.

Nicholson and Eva highlight that the existing information literacy gap is a result of student expectations for instant information access which results in a willingness to settle for "less than optimal" information¹⁰. It has been reported that students consistently overestimate their information skills which lead them to avoid attending training¹¹. Rowlands et al (2008) argue that the notion of a 'Google generation' being distinct from other generations is a myth, but questioned whether we are too late to change the 'ingrained coping behavior' that students have learned from relying heavily on internet search engines¹². This claim was supported by Dominey & Denick who conducted research with first year graduate students in the Biology and Chemistry

departments of Drexel University during the spring term of 2010. They indicated that these students were not adept in using their primary databases, especially for extensive literature reviews¹³. Secker and Marcare Gibson, citing a study, report that Web 2.0 technologies leads to development of a strong sense of communities of interest” but “has also led to impatience...to a casual approach to evaluating information and attributing it and also to copyright and legal constraints. The report recognized that “information literacies were a “significant and growing deficit area”, and over a six week course period, as students built upon their skills they achieved a confidence and adeptness that was simply not achievable in other one off instruction sessions that were held. This proved that the training had a significant effect on students as they were able to develop their information literacy skills at a much higher level¹¹.

In order to be considered as relevant and important, the librarian’s contributions must be highly regarded by both the course instructor and students alike. It is extremely difficult, if not impossible, for librarians to effectively access distance learning students without the cooperation of faculty. It is vital that course instructors emphasize and encourage their students to use library resources for their course work, as without such reinforcement students are less likely to seek them out. Of course, this is especially true for distance learning students who are unable to access the library physically. In their study, Gutierrez and Wang report that those students who regularly used the library benefited most from literacy instruction. This reinforces the argument that research skills require practice. A single library research class is not sufficient to significantly improve information literacy skills. Students tend not use the library until they have a specific need. It is the responsibility of faculty to generate that need by incorporating assignments that require their students to use library resources¹⁴.

Through collaboration with Drexel University Libraries, online instructional sessions will be planned, designed, and executed. These include:

1. Developing quality information seeking and research and educational skills.
This session highlights important resources available for online students in engineering and engineering technology programs. Awareness of and efficient use of these resources is absolutely necessary for students to successfully complete their assignments and projects. There are number of electronic book collections, such as Knovel, ENGnetBASE, ebrary, Books 24X7, and Safari that are available online. Through these collections students can develop necessary educational skills required to complete various assignments.
2. Keeping current with new technological developments.
This session covers current case studies using Web 2.0 applications, such as blogs, feeds, bookmarking services, aggregators, and social networking services to illustrate their roles as information awareness tools. Students learn how to keep current with news, information, and latest technological developments.
3. Efficient management of quality references.
This workshop highlights the importance of citing sources of information in the academic environment. Whether students are writing a research/educational paper or completing an assignment for a class, it is extremely important that they provide appropriate references,

including journal article, book chapter, a web site, images or any other types of resources used for completion of the project. Citation management tools, such as ENDNOTE and REFWORKS, are used to demonstrate how effective bibliography of citations can be built. Students also can manage citations and keep track of the sources used in their projects.

Web Conferencing Technologies

With available technologies, such as Web Conferencing, Chat Reference or Instant Messaging, Email Reference, Course Management System Integration, Blogs, Text Messaging, and Telephone service, distance learners receive necessary assistance needed for their projects and assignments through virtual environments. Library instructional sessions can now be held through these technologies. Online students at their convenience will be able to learn new information research and educational skills. They can also simultaneously ask questions and share their thoughts with their online classmates resulting in an interactive and engaging learning environment.

Adobe Connect Pro is one such conferencing platform available through University's Information Resource and Technology Office. The advantage of using Adobe Connect Pro is that students do not need to install anything on their computer. Students can converse and watch library instruction sessions through a 'Virtual Room' specially created for this purpose. Once students enter this "Virtual Room", they are able to participate in the live synchronous library instruction session. Since instructors can share their screens, students are able to navigate through various slides or through various electronic resources that they are exposed to during the session. Any instructional handouts, readings, and homework assignments can be shared through this highly interactive and engaging virtual platform. A screenshot of Adobe Connect Pro (Figure 1) shows some applications demonstrating how important websites, PowerPoint presentations, and presenter notes can be shared. Students can virtually 'Raise Hand' and ask questions.

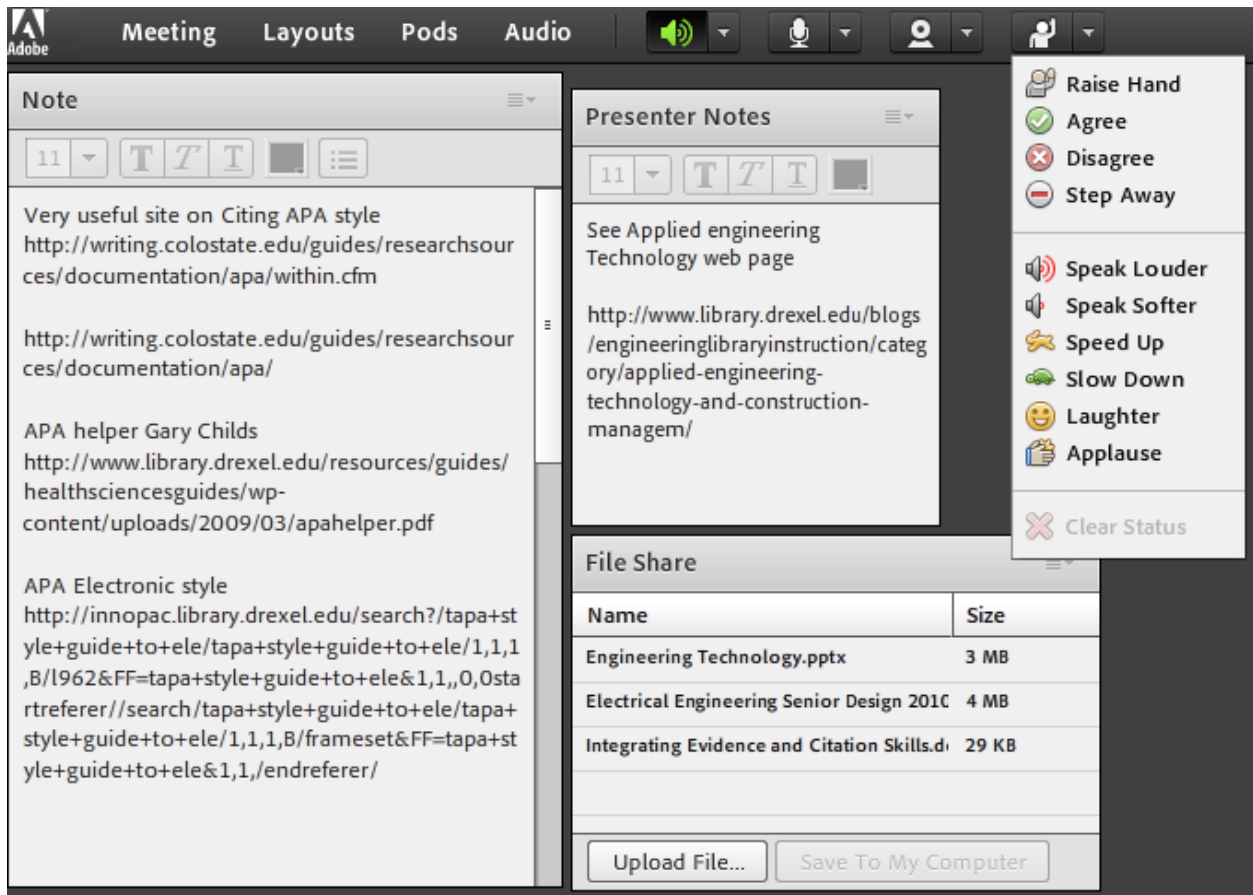


Figure 1. A screenshot of Adobe Connect Pro.

In addition, the following services are available at Drexel University Libraries for distance learners:

1. Chat Reference/Instant Messaging.

Chat referencing provides virtual access to the engineering librarian for quick assistance. Chat referencing option is available from Drexel University Libraries home page as well as engineering librarian's main home page. Those students who use Gmail account can also contact the librarian through their Gmail chat reference. This service provides instantaneous support to students assisting them with responses to their questions seeking information on any topic.

For example,

A real life chat reference question:

"I am writing a research paper and am thinking my topic might be "How has the invention of the gasoline engine affected the rural economy over the past 150 years?" but I kind of have no idea where to start researching. Can you help me?"

Students can ask any questions through this important service from anywhere anytime. Immediate assistance is provided upon request.

2. Electronic mail reference.

Electronic mail reference has been very successful among engineering and engineering technology students on campus. Engineering librarian provides responses to approximately 70 email reference questions per month to the students. Due to increased number of online resources and their complex search mechanisms, for example, Knovel database of online electronic handbooks, students need specialized assistance from librarians. The librarians provide various sources of the appropriate requested information. An example of an electronic reference question would look like:

“I am working on a presentation for my Body Synthetic class on bionic limbs and artificial intelligence. I'm having a hard time finding scholarly articles and research papers on this topic. I was wondering if you could please help me with this.”

3. Course Management Systems.

Since course content, syllabus, lectures, and other important documents will be available through the online course management system, it makes sense that even library instruction and reference be embedded through course management systems. Appropriate course web pages and research guides can be linked through these systems providing easy access to students. Course specific online books can also be linked so that students can access them through the course web pages. Faculty members in collaboration with the engineering librarian can identify appropriate online books or book chapters for their classes they teach for linking. In the old traditional system, journal articles and readings were made available through Libraries' reserve system but now they can be made available online through course web pages. Virtual consultations through email feature available will provide easy mechanisms for students to seek virtual assistance from librarians. A screenshot of a library supported online course page is presented in Figure 2.

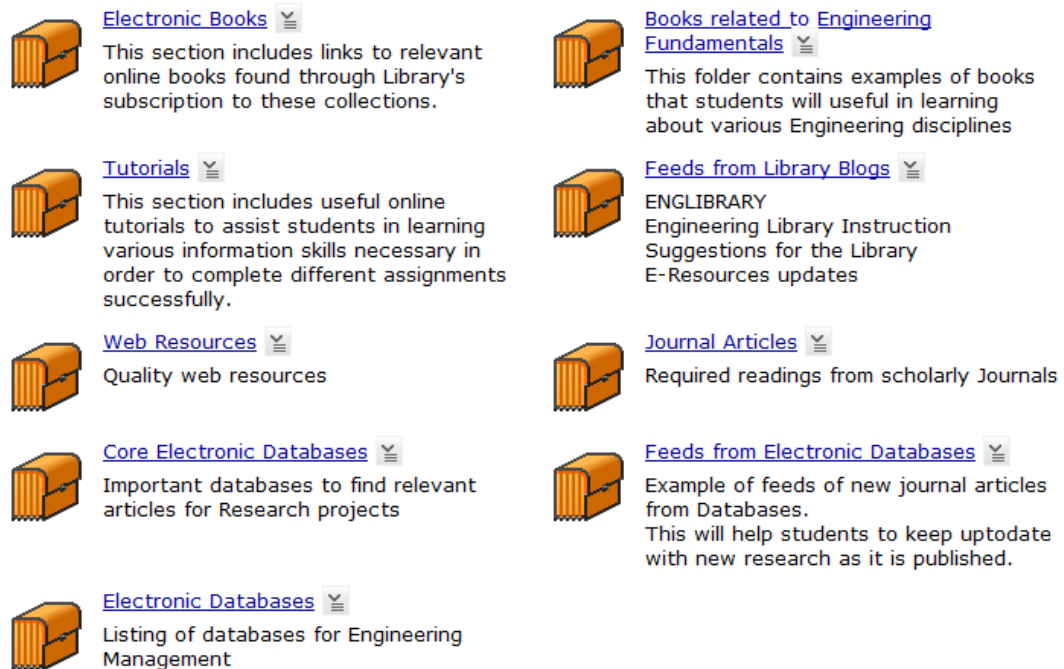


Figure 2. A screenshot of a library supported online course page.

4. Telephone Service.

Some students may prefer to converse with librarians on the telephone to seek assistance. The Libraries now provides toll free phone service where students can be able to ask any questions relevant to their research/educational projects or assignments. They may even ask simple questions, for example, how can I request a book from the library so that it can be shipped directly?

5. Text Messaging.

Drexel University Libraries' reference service has now been expanded to include questions by text messaging. Students can send their question to 918-DREXEL1, or 918-373-9351, between 8:30 am and 5 pm. Students in online programs can also ask a question by texting **drexellibraryref** and sending it to 265010 between 8:30 am and 5 pm and receive quick assistance.

6. Blogs.

Engineering librarians created two blogs to highlight core electronic resources and useful searching tips for core engineering related databases. These blogs can be accessed either through the University Libraries' website, Engineering Librarian's web page, or simply by searching in any Internet search engines. The two blogs are: EngLibrary and Engineering Library Instruction. Englibrary blog provides access to Web and electronic resources to help students keep current with engineering information. The Engineering Library Instruction blog provides tips and links to online tutorials on how to use different databases more effectively and efficiently. This blog also provides access to a number of useful resources for Engineering Technology students. Both blogs can be linked through the course management systems for easy access.

A screen shot of a partial blog item from Engineering Library Instruction that highlights resources for engineering technology students is presented in Figure 3.

Engineering Library Instruction

October 1, 2011

Construction Management and Engineering Technology Resources

Plagiarism

- [Plagiarism Guide](#)
- [Plagiarism Powerpoint](#)

Books

Click on the links below to see what books are available in the library in some key areas related to Manufacturing Engineering, Mechanical Engineering, Electronics and Nanotechnology

- [Applied Mechanics](#)
- [Biomedical Technology](#)
- [Construction Management](#)
- [Hybrid and \(Car or Automobile*\)](#)
- [Mechatronics](#)
- [Sensor* and Instrumentation](#)
- [Thermodynamics](#)
- [Electrical Technology](#)

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- Click on [Articles & More](#) Tab in the Library Home page
- For example, type 'Sensors and Measurements' and click on Search Library link.
- Refine your search results by selecting an option from the left column. For example, select 'ebook' option. You will see a listing with links to electronic books.
- Try Summon for quick search. For more in depth search, explore the resources below.

Figure 3. A partial blog item from Engineering Library Instruction.

Assessment

Through collaboration with Drexel University Libraries faculty and staff an online assessment tool has been developed. It is designed to help students practice using the Libraries' services and resources that they will need to gather information for their engineering research projects. Two versions were created so that students would not receive the same assignment. This virtual exercise can be given to online students in the MSET Program. There are a total of 27 questions on topics dealing with searching online engineering books, scholarly journals, research tools and strategies, and patent searching.

The students will learn to perform the following research tasks:



- Find basic information on a subject of interest in both print and electronic formats
- Develop advanced search strategies to find specific information
- Conduct effective searches for patents

The assignment will take approximately 30 minutes to complete. They may exit the exercise and return at a later time; however, they are not allowed to start over. Students must answer 90% of the questions correctly; otherwise the assignment will have to be retaken. In order to successfully complete this assignment, students will need to use the Libraries' website, tools, and resources.

An example of a question is included below:

Engineering Research Library Resources Exercise - Version 1

Step 3 of 27

Question:	Score 0 of 1
What is the call number for the book <i>Microscale Diagnostic Techniques</i> ?	
Response:	
	<p>RC787 .D53 M367 1999</p> <p>Feedback: <i>Sorry, that is incorrect.</i> RC78.7.D53 M367 1999 is the correct call number. Use the location information along with the call number to find a print book in the Libraries.</p>
	RC7.87 .D53 M367 1999
	R78.7.D53 M367 1999
	RC78.7.D53 M53 2005

Find the ebook written by Reimpell that provides a comprehensive overview of automotive chassis technology. The book is available in the ebooks section of **Engineering Village**. What is the title of the first chapter of the book?

Choose one:

<input type="radio"/>	Types of Suspension and Drive
<input type="radio"/>	Steering
<input type="radio"/>	Vehicle Structure
<input type="radio"/>	Design of Chassis

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Figure 4. Engineering Research Library Resource Exercise.

We hope to make this exercise available to students as soon as possible.

Summary

A new online Master of Science in Engineering Technology program at Drexel University has been developed and classes initiated during the 2010–11 academic year. The MSET degree is intended to be a terminal professional technology degree focused primarily on the applied aspects of the technological spectrum closest to product improvement, industrial practices, and engineering technology operation functions. It is designed to meet the needs of graduate students who want to expand their knowledge in advanced engineering technology courses. It also provides the flexibility for graduate students to expand their knowledge in a specific technical specialty. The program uses a professional, multi-disciplinary, team-oriented, and project-

oriented approach to graduate education. MSET faculty, and Drexel University Libraries collaboration plays crucial roles in imparting information research and educational skills to graduate students in various class assignments and projects. Problem solving skills, educational skills, and applications of scientific and technical knowledge can be developed and maintained by accessing a number of online handbooks, encyclopedias, journal articles, and other source material available through the University Libraries web site. Various technologies highlighted in this paper can be effectively implemented to provide necessary assistance to students for their projects and assignments through virtual environments. Web conference technologies, such as Adobe Connect Pro and Skype, online tutorials, can enrich their learning experiences through engaged and interactive experience.

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