

# A Qualitative Analysis of Best Practices in IA Online Synchronous Instruction

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**Abstract** – *Tasked with improving enrollment and retention, institutions of higher education are increasingly utilizing online delivery in the battle to attract and retain students. Understanding effective online practices can improve the learning experience for both students and the institution. In this paper we describe the results of two studies whose purpose was to identify some best practices in online delivery of master’s level information assurance education utilizing a hybrid synchronous (real-time) and asynchronous delivery method. The first study, which provided secondary comparative data, examined best practices from the faculty perspective of the online synchronous (real-time) and asynchronous delivery model applied to information assurance master’s level education at a small 4-year institution of higher education. The primary study for this paper examined best practices from the student perspective of the online synchronous (real-time) and asynchronous delivery model applied to information assurance master’s level education at the same 4-year institution. Examination of the results of the two studies revealed significant similarities in faculty and learner perception of best practices. A comparison of the two studies also resulted in recommendations, which serve as guidelines for other institutions of higher education reviewing information assurance curricula as well as provided ideas for future research.*

**Index terms:** Distance Learning, Information Assurance, Qualitative, Content Analysis.

## I. INTRODUCTION

Vast improvements in technology associated with the delivery of online education have provided new opportunities for institutions of higher education as well as the students they serve. New technologies provide higher education opportunities to better meet the changing demands of a new generation of learners. The current generation of learners is inextricably linked to technology as they have become markedly dependent on technology for daily activities [1]. In the role of student, the new generation has developed a learning style that has embraced the use of multi-media with great enthusiasm to the point of dependence [2].

Rapid changes in technology linked to access and communication are redefining education delivery systems. As a result, it is changing how faculty and students experience education. Technological advances in synchronous (real-time) interaction over the Internet have allowed institutions to mimic more closely the face-to-face classroom experience. Despite the concerns about the effects of multi-media on learning colleges and universities find themselves increasingly utilizing online delivery in the battle to attract and retain students [2] [3].

Institutional viability is dependent on the quality of education from both the institutional and student perspectives. Therefore, as the delivery of education incorporates new technologies, attention should be given to course delivery in order to meet the demands and expectations of the student, governing body and accrediting institutions [4]. Dede [5] argued that the “effectiveness of online courses depends not upon technology but upon an understanding of the medium and the application of sound pedagogical principles in using the medium” (p. 28). There is a need for the institution to continually re-evaluate the factors contributing curriculum success in an effort to remain cognizant of the institutional changes necessary to control and improve these institutional elements.

Improving leadership and faculty understanding of effective online practices provides opportunity to improve the learning experience for both the institution and the student, improves support for the pedagogy necessary for effective online instruction, and provides guidance for faculty transitioning from face-to-face to the online teaching environment. This qualitative case study used data from research on best practices in online delivery of information assurance (IA) graduate education from the faculty perspective as examined at Capitol College, a 4-year institution in Maryland delivering distance education via a hybrid online real-time synchronous platform (Centra) (<http://www.saba.com/>) supplemented by a learning management system (Blackboard) (<http://www.blackboard.com/>) [6]. In addition, this study collected new data from the same college via surveys examining best practices from the IA graduate student perspective as it relates to course delivery utilizing the same two platforms. The sample population associated with the new data consisted of 20 IA graduate students. This sample size matched that of the previous faculty study [6].

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Student perceptions of IA online instruction are important to understand as the face of IA education is rapidly changing as well. Information assurance is no longer a nascent field and the core tenets of IA education have solidified, particularly in the case of schools designated as National Centers of Academic Excellence in IA Education [7]. However, the foundational aspects of IA-tools, policies, as well as laws and regulations- continue to evolve in step with technology.

Online IA learners are evolving as well. Compared to those students entering graduate degree programs a number of years ago, learners today matriculate with a higher measure of technical expertise and domain knowledge [8]. Additional evidence for the growth in IA learner proficiency takes form in more rigorous IA graduate degree program pre-requisites, accreditation standards for schools offering IA education, and the number of non-graduate programs now available [7].

At the same time, online IA graduate learners expect more integration with technology, particularly with respect to active, hands-on learning. Bhagyavati [9] commented that laboratory exercises serve a critical role in the success of Information Assurance (IA) education. Research supports this claim both qualitatively [10] as well as quantitatively [11] [12] [13].

This study investigates online IA students' perceptions of best practices in online IA instruction. In particular, the investigation focuses on how the progressive IA learner perceives synchronous lectures, asynchronous laboratory exercises, and utilization of the Centra and Blackboard technologies in Capitol College courses. When comparing the previous and current studies- that is, faculty perceptions and student perceptions- this study provides several recommendations. Such recommendations serve as ideas for future research as well as guidelines for other institutions of higher education reviewing IA curricula.

## II. STUDY OF FACULTY PERCEPTIONS

The previous study [6] considered in this paper was a qualitative case study that examined the teaching practices of IA faculty at Capitol College in an effort to identify some best practices. The 20 faculty members participating in the study were facilitating courses using a blended online synchronous and asynchronous delivery model. Data were collected using semi-structured synchronous online interviews. Initial open-ended interview questions were constructed to elicit general information about teaching practices of faculty. A pilot study was conducted to test the interview questions. Ten follow-up questions driven by responses to initial interview questions promoted more in-depth descriptive details from study participants.

A single transcriptionist was engaged for transcription of recorded interviews to ensure reliability and validity of data. In order to confirm context accuracy of the transcriptionist the researcher transcribed five random interviews. The study used content analysis to analyze the qualitative data collected. Data reduction was accomplished through a process of selecting, focusing, simplifying, abstracting, and transforming. NVIVO ([http://www.qsrinternational.com/products\\_nvivo.aspx](http://www.qsrinternational.com/products_nvivo.aspx)) was utilized in the analysis of data.

Eight highly relevant thematic categories emerged from the study interviews. They were: (a) role of the educators, (b) integration of synchronous and asynchronous tools in online education, (c) competency required for online educators, (d) difference of online education from face to face education, (e) type of training received by online educators, (f) expectations from online education students, (g) ways online educators capture the attention of their students, and (h) ways online education promote the existence of online learning community [6].

Results, shown in Table 1, indicate that faculty believes that the live synchronous environment is best used for lecture delivery and student/faculty discussion. Faculty also indicated that the asynchronous environment is best utilized as a lab environment and in the case of Blackboard a depository for course materials and off-line discussions. However, some faculty believes asynchronous tools are under utilized. Speaking to competency skills faculty believed that other than course topic competency faculty needed technical and communication skills commensurate with the technology utilized. Related to technical competency was the identification of the need for proper training of both faculty and students in the use of course tools prior to class attendance.

The ability to replay lectures, easy access to course materials, less threatening form of communication, and non-verbal aspects of communication were identified as the key differences between online education and face-to-face education. The lecture replay feature provides significant opportunities to reinforce course material. One potential drawback of this learning environment identified was the inability to use non-verbal cues in the learning process. Consensus was that participants must learn to use voice to compensate for loss of non-verbal communication as well as utilize the emoticons provided by the platform for expressing emotion.

Faculty reported in this survey that another drawback of the environment is that it appears more difficult to engage learners in the online environment than in the traditional face-to-face classroom. This is particular drawback is identified in other research examining online education [14] [15]. The use of multi-media by participant faculty provides students opportunities and the flexibility to actively

**Table 1. Faculty Perceptions**

Themes	Participant Perceptions	
	Majority Perception	Minority Perception
Role of faculty	Facilitator	Instructor; multiple roles
Synchronous lectures	Primary mode of course delivery; no change	Split between more lecture time & less lecture time
Asynchronous environment	Compliment synchronous	Support tool; posting course material
Use of Centra technology	Utilize multi-media capabilities; training critical	Use is intuitive
Use of Blackboard	Effectively used for assignments, course materials, labs; training critical	Use is intuitive; Under utilized
Expectations- faculty of student	Quality participation key; All faculty support online learning community	Participation is good, but not absolutely necessary

participate both inside and outside the classroom. Further, the technologies utilized provide the flexibility to address the diversity of learning styles [16]. Faculty generally agreed that participation of students was a mandatory element of classroom success noting that participation is a factor of quality not necessarily quantity. Faculty indicated that at the graduate level sharing of experiences and ideas is critical to classroom success. Sharing of ideas and experiences was also the predominant method identified for promoting an online learning community.

The majority of faculty engaged learners by asking questions and varying the media used to deliver the message. Failure to engage learners results in a faculty driven rather than learner driven environment. Faculty were unanimous in their wish not to “drone on” speaking to slides on the screen; they preferred engaging discussions.

Opportunities exist for the participating institution and its online faculty to make enhancements to the delivery of the IA online master’s program, which will potentially increase the quality of the learning experience for all participants. Institutional commitment to faculty and student training and support in the areas of basic use of platform tools, integration of current multi-media tools, and techniques that facilitate learner participation plays a critical role in the effectiveness of the program. The same

level of commitment applies to the lab features of the IA program.

Future research recommendations of this study included the examination of student perception of best practices in an online learning environment at Capitol College. In addition, it was recommended that the perceptions of faculty and students be compared. Finally, the researcher recommended that additional case studies or a multi-case study examining the synchronous and asynchronous environment described in this study be undertaken.

### III. STUDY OF STUDENT PERCEPTIONS

The current study investigated student perspectives of best practices in IA master’s level online instruction using synchronous (real-time) and asynchronous delivery at Capitol College. The study collected data using asynchronous interviews (e.g. email). The interview consisted of 7 open-ended questions. The interview questions captured general attitudes towards and depictions of IA online instruction best practices.

The study selected participants randomly from a 36 credit hour online Master of Science in Information Assurance (MSIA) degree program. The study population included current graduate students and alumni. Study participants have used the synchronous and asynchronous technology platforms to engage a variety of course topics including network security, risk and vulnerability management, malicious software and reverse engineering, computer forensics, as well as law and regulations. Principal courses map to the 6 Committee on National Security Systems (CNSS) domains. As we used a single institution case study method examining a single Master’s degree program (entrance requirements are applied) it can be assumed that student technical skills are similar. Lastly, the study did not select participants based on credit hours completed or based on (participant) self reported technical ability. By not selecting based on such criteria, the study aimed to include all potential student perspectives while not introducing selection biases.

Syntactical content analysis was employed to analyze the collected data. The qualitative analyses focused on participant’s use of the key syntactical indicators relative to the interview question. Examples of key syntactical indicators include terms such as good, great, more, less, same, as in, poor, and change. Questions left unanswered by participants were coded as no response. In all cases, individual responses were reduced into coded categories using simplification, abstraction, and transformation operations on the key syntactical indicators.

Seven themes came to light during coding and tabulation of these syntactical indicators surrounding facets of IA online instruction. These themes centered around (a)

synchronous lecture, (b) asynchronous laboratory exercises, (c) switch synchronicity of lecture and laboratory exercises, (d) utilization of Centra technology, (e) utilization use of Blackboard technology, (f) Centra and Blackboard training, and (g) lab support. Furthermore, student perceptions within the thematic categories fell into two groups: majority perceptions and minority perceptions. The themes are listed, along with participant perceptions within the context of each IA online instruction theme, in Table 2.

The current study results indicate that students perceive synchronous lectures as vital to IA online instruction. The data suggest a parallel to Pence's [2] assertion regarding modern learners' proclivity for technology. Furthermore, the majority of participants articulated that they liked the current amount of lecture, conducted synchronously in Centra. The minority of participants was split rather evenly between interest in having more lecture time and having less lecture time synchronously in Centra.

Moreover, when the first thematic category is blended with the participant responses in the third thematic category, it is clear that the majority of students do not want synchronous lecture displaced. At the same time, the majority of participants are open to inclusion of laboratory demos during synchronous classes. Since such demos typically are faculty driven, it is logical to deduce that students perceive demos as direct extensions to traditional lecture. The preference for synchronous lecture corresponds to the findings by Cavanagh and Albert [8].

Students are overwhelmingly interested in more laboratory exercises. A minority commented that current levels of laboratory exercises are sufficient. Again considering the third thematic category, there is strong indication that the majority of students perceive laboratory exercises as best suited for asynchronous class time. On the other hand, the minority believes that conducting laboratory exercises during synchronous class time might be a favorable change. Overall, the perceived value of laboratory exercises in the current study adds to existing quantitative research by Schweitzer and Boleng [12] as well as Weiss and Mache [13].

The student perceptions of keeping synchronous class time for lectures and asynchronous for laboratory exercises is further supported by participants' responses concerning utilization of Centra and Blackboard technology. The majority, in both thematic categories, viewed Centra and Blackboard as well utilized for live lecture and asynchronous assignments respectively. Conversely, the participant minority saw opportunity for faculty to incorporate more of the Centra and Blackboard technology into synchronous and asynchronous class time respectively.

**Table 2. Student Perceptions**

Themes	Participant Perceptions	
	Majority Perception	Minority Perception
Synchronous lectures	More lab exercises	Do not change
Asynchronous lab exercises	Compliment synchronous	Support tool; posting course material
Switch synchronicity of lectures and lab exercises	Lecture synchronously with some lab demonstrations	Favor change
Use of Centra technology	Centra is well utilized for live lecture and discussions; intuitive	Faculty could expand use of Centra technology to deliver lectures
Use of Blackboard	Blackboard is well utilized for asynchronous assignments; technology is intuitive to use	Faculty could expand use of Blackboard technology to deliver assignments, discussions, and support; additional training for faculty and students
Lab support	Not Needed	More lab support

It is interesting to note that the majority of students perceive Centra and Blackboard as intuitive to use while the minority feels that additional, regular training might be warranted for both students and faculty. Coupled with perceptions of Centra and Blackboard technology utilization, a logical deduction might be that students do want to see full use of the IA online instruction technology in order to maximize the learning experience. Such intuitiveness expressed by the participant majority aligns with existing literature [1] [2]. Comparatively, the view that additional training may be called for aligns with qualitative results shown in Barker [6].

Regarding the lab support theme, the majority of students reported that lab support had not been necessary in their experience. On the contrary, the participant minority suggested additional lab support. Considering that the majority of participants called for more laboratory exercises to be incorporated into classes, lab support may be perceived differently in the future.

Based on the results of the current study, it appears that students hold a positive perception of the IA online

instruction technology. The comfort level with the IA online instruction technology supports Bhagyavati's [9] assertions regarding the relative sophistication of today's IA learners. Moreover, the emergent themes discovered during content analysis suggest that students are pleased with the current state of synchronous and asynchronous hybridization. In fact, participants were quite opposed to the thought of reversing the synchronicity of lectures and laboratory exercises such that laboratories were completed during synchronous class time.

The majority perception that additional laboratory exercises would be beneficial, along with the minority perception that faculty could further integrate Centra and Blackboard into courses, serves as a clarion call. These views are decisively in favor of IA online instruction to further utilize both technology unique to the field of study as well as online education delivery technologies.

#### IV. CONCLUSION

Overall, the results of the study show a commitment on the part of Capitol College faculty and students to quality online IA education. Both faculty and students support the use of Centra as the primary course tool as well as identify Centra's purpose as a lecture medium. There exists some disconnect among faculty and among students as to the use of the asynchronous learning tools. The majority of faculty perceived Blackboard as well utilized, while students perceived a need for expansion of the use of the tools available through the platform. Results indicate that students tend toward the maximization of the technological opportunities while faculty are satisfied with the basic services of the platforms. There is also a difference in the perceptions of faculty and students as it relates to training. While the faculty majority noted that training is critical, student majority argued that it is intuitive. Neither a faculty or student majority identified a need for increased lab support.

Some limitations of the current qualitative case studies include small sample size and scope and purposive sampling. While it is not the purpose of qualitative research to generalize findings from the sample population, a case study sample size of 20 is a limitation. Despite the limitations, the study is significant in that it adds to the literature examining online learning environments. Study results provide information for institutions and their faculty from which they can develop strategies to address online curricula and better prepare faculty for the transition to online course delivery.

Technology has the potential to push beyond the simple enhancement of education; it has the potential to fundamentally change education. The activities that take place in the learning environment play a critical role in the success of the course and overall degree program in

terms of outcomes assessment and stakeholder satisfaction. This is no less true for the online environment. "Understanding the methods, tools, processes, and perceptions associated with the delivery of online education" [6] (p. 11) will provide opportunities to enhance learning and teaching.

Based on student perceptions, several recommendations for future research exist. Foremost, continued research into integration of hands-on laboratory exercises in IA online education has the potential to increase learner information acquisition and retention of learners in online IA programs. Furthermore, additional research into blended utilization of the Centra and Blackboard may yield interesting results that help educators and students alike make use of those technological platforms.

Finally, it is possible that both faculty and students at other higher education institutes hold different perceptions regarding IA online instruction best practices. It may be beneficial to the IA field, as well as to such schools, to establish an ongoing platform for sharing best practices. By openly sharing best practices, educators may more appropriately adapt to the advancing tides of technological advancement.

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