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The Role Played Case:

An Experiential Approach to Teaching Introductory Information Systems Development

ABSTRACT: Information systems development needs to be taught using an expe- riential approach. This is difficult when introductory classes are large and the stu- dents have no knowledge of the complex social and business environments in which developed. This paper presents a teaching approach called a role played case as an experiential tool for large classes of introductory IS students. These cases involve students behaving as systems analysts confronting an actor who role plays a client from a real business organisation environment. The role played case approach IS compared and contrasted with the traditional written case approach and is shown to have significant advantages, particularly in allowing direct interac- tion between the student and the complex personal and social environments associ- ated with information systems development. A phenomenographic research tech- nique was used to investigate the students' perceptions of the learning context asso- ciated with a role played case. It is considered highly desirable to provide a learning context in which students attempt to understand the material being presented and relate the new material to the rest of the curriculum. This is known as a deep learn- ing approach and is associated in the phenomenographic view of learning with con- ceptually significant learning. The investigation showed that a majority of students perceived the learning context associated with the role played case as requiring a deep learning approach. As a result of the investigation an enhancement to the role played case approach was developed with the aim of increasing the proportion of students who are able to apply a deep learning approach. Finally, the paper recom- mends the further use of phenomenographic techniques in information systems education (ISE) research.

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INTRODUCTION

The need to teach information systems (IS) development using an experiential approach is well documented in the lit- erature. A number of teaching methods have been reported which assist stu- dents to achieve the knowledge, skills and awareness of complex business envi- ronments they will need in industry. One such method is to include a real- world or simulated long term project in the curriculum [1] [2] [3]. This method is not suited to an introductory IS subject, however, because: the theory of systems analysis and design needs to be taught before any long term project can be considered.; the organisation and supervision of projects is resource intensive and beyond the capabilities of most IS schools with large introductory classes.

Written case studies are another teaching approach used to provide 'real' experience. They are also consid- ered to be unsuitable at the introductory level because of problems concerning:

Their impersonal nature. Students are not required to communicate with users or interact with the complex social environment in which an information system is developed.

Their static nature. User requirements are detailed in the case and cannot change. Any assumptions that need to be made by the student cannot be verified.

This paper proposes an alternative experiential teaching approach suited to large numbers of introductory IS stu- dents and known as a role played case. In this approach students behave as sys- tems analysts confronting an actor who role plays a client from a real business organisation. The role played case approach is contrasted with the written case approach. A structured evaluation of an implementation of a role played

case is then reported. This evaluation incorporates phenomenographic research techniques pioneered by the Gothenburg School [4] .These tech- niques allow the researcher to identify and describe the qualitatively different ways students understand or perceive a phenomenon. These descriptions can then be used for reflection on the worth of the teaching method [5].

The use of a structured evaluation technique is an important aspect of this paper. The IS literature reports very few structured evaluations of courses or teaching approaches. A typical evalua- tion is based on lecturers' general feel- ings for the success of an approach or their interpretation of students' com- ments. Lacking any research rigour these evaluations also disregard the well docu- mented biases inherent in teachers observing their own classes [6] [7] [8] [9],

BACKGROUND

The nature of IS courses in Australia provides unique teaching difficulties when compared to the US situation. IS development is taught in the first year of undergraduate degree and postgrad- uate diploma IS courses. Indeed it is commonly the first subject encoun- tered, running concurrently with the first programming subject. In under- graduate courses students may have no previous computing experience. Postgraduate diploma courses in IS require an undergraduate qualification in an area other than IS or computing. As a result, when designing teaching approaches for the implementation of introductory IS curricula the important assumption needs to be made that stu- dents have little computing background and varying business knowledge and life experience.

The techniques and skills of systems analysis and design are applied, in prac- tice, in the complex social and organisa- tional setting of a business. The systems analyst needs to be aware of the way organisations operate, how information is used within an organisation, how peo- pie interact within an organisation and how to interview and deal with people feeling threatened by possible change. Any IS teaching approach which relies entirely on verbal or written instruction could not adequately prepare an indi- vidual to operate in such an environ- ment. An experiential approach is essential.

WRITTEN CASE STUDIES The written case study is commonly
used in an attempt to provide a link between theory and practice. It is a pop- ular teaching technique iI) MBA and undergraduate curricula as shown by
the proliferation of cases of all sizes in text books.

Some major benefits of the written case approach follow: .

Students are able to apply concepts learned from lectures or textbooks, to new situations, thereby making good use of a wide range of the cognitive
skills necessary in systems analysis and

design [10] .

The approach supports groupwork. This is of two benefits to the IS student:

IS professionals will spend a consider- able proportion of their employment working in teams or supervising teams of other professionals or clients [11] [12] [13:] [14].

Both cognitive and affective educa- tional gains have been recorded for stu- dents working in small groups com- pared to working individually [14] [15].

A sense of realism is added to class- room discussions. This can enhance stu- dent involvement [16].

Students feel secure dealing with the written word. They generally believe
that because something is written down it is indisputable.

It is applicable to large numbers of students and with small group discus- sion, pressure on staff is reduced.

Weaknesses perceived with the written case study approach are:

Students are missing out on the fact finding and analysis stages. Deciding on interview questions and planning the fact finding are important facets of sys- tems analysis but not part of a written case study. The fact that the case is in a written format implies that some analy- sis has already been done.

Questionnaire design and practice at open-ended interviewing are also absent.

If students feel that all the facts are not present in the case they are forced to make assumptions without knowing how realistic to be and without being able to verify the assumptions.

Written cases may contradict students' sense of reality. Because the definition of the system is artificial, students can- not confidently apply their own experi- ence to validate the case.

The problem is set down on paper and cannot change, unlike typical IS requirements, leading to predictable, similar solutions.

A case does not provide experience of the physical limitations which may accompanyan IS development such as organising, preparing for and keeping appointments.

By their nature written cases are ofte simplified. Removed are the human an social complexities inherent in real- world situations [17] .

A written case takes away the person: contact aspect of determining a user's requirements. Nantz [18] reports on a number of US studies which indicate that employers nominate communica- tion and interpersonal skills above sys- tems analysis skills in their requiremen of new IS graduates.

A case necessarily needs to contain most of the IS requirements, precludin the experience of a client who may not be able to express their requirements o who deliberately withholds them.
One of the most difficult aspects of systems analysis is defining the scope oJ the system to be investigated. Written cases must contain all the required information thus obviating the need fo the students to define the boundary.

THE ROLE PLAYED CASE APPROACH

This approach involves the re-enact- ment of the systems analysis componen of the development of a small IS. An actor is co-opted to role play the client and the students role play the systems analyst. A previously completed, real-Iif, IS is used to ensure as much authentici ty as possible. Students, working in teams of two to four, are introduced to the case through a newspaper advertise ment which outlines an information storage problem and seeks expressions of interest in an IS development. Detail of three interview opportunities with the client are advertised to the student.\ The initial interview occurs in a lecture attended by all students. The client explains the background of the project, overviews the problem and asks for questions. Individual students ask ques- tions which, along with the ensuing answer, are recorded by all students. The two further opportunities to ques- tion the client occur in small-group tutorials a week and a fortnight after the first interview. All students in the tutorial group have the chance to bene. fit from each student's questions. Each student team is expected to develop a

systems requirement document for the client from the data they have obtained in the three interviews.
To give stUdents experience of a wide range of the circumstances they can expect to encounter in industry the actor is required to initially adopt a mildly contrary personality. The first interview is approached by the client with a grandiose idea for an IS but with little forethought about detailed requirements. A general lack of confi- dence in computers and a determina- tion to protect a hard-won standing within an organisation are typical of a client's initial attitUdes in a role played case. StUdents will not gain many pre- cise requirements from the first inter- view, but are left to wonder how the client seemed to control the interview, yet provide so few facts. The client grad- ually relaxes over the following two interviews and responds willingly to the students' questions. Inadvertent alter- ations to previously expressed require- ments are deliberately included, however.
A number of different cases are used on a rotating basis. Examples are an angling control body's system for col- lecting fish catch data and a water authority's system for recording and billing irrigation water usage.

Advantages of the role played case approach are:
Students must personally interact with a client who is unknown to them. The client does not initially behave in the manner they expect or would like.
Students must use communication skills to clearly get their questions across to the client.
Unlike a written case stUdy the total description of the system is not initially available but develops over time.
Students are able to experience a situ- ation where the user changes or varies their specification over time.
Interviewing and fact finding experi- ence are gained.
The difficulties with documenting interviews are demonstrated in a practi- cal manner.
The stUdents must demonstrate organisational abilities. If they are not

prepared in advance for an interview they miss out on many of the require- ments.
It can be used with large student numbers (cases have been conducted in classes of up to 100 students) .

Disadvantages of this approach when compared with the written case approach are:
The approach has to be centred on the client's availability rather than enabling the lecturer to hand out a photocopied or printed case at any time. Actors are not always easy to
locate and need to be unknown to the students, precluding other staff mem- bers. In addition when many tutorial groups are involved a considerable time commitment is required from the actor.
Students may have to prepare the final documentation without all the desirable data if they have not per- formed the interviews satisfactorily.
Students can relyon other students' actions in the interviews. Multiple teams interview the client at the one time.
Each team is able to benefit from the other teams' questions.
This approach is used in the introduc- tory information system subject and so students confront the analysis task with- out having experienced the design or construction phases of an IS develop- ment.

EVALUATION OF A ROLE PLAYED CASE STUDY

A structured evaluation of a role played case is now given. The evaluation uses a phenomenographic research approach. The most cited description of phenomenography comes from Marton [19]:
Phenomenography is a research method adapted for mapping the quali- tatively different ways in which people experience, conceptualise, perceive and understand various aspects of, and phe- nomena in, the world around them (p.31).
Phenomenographic studies have
found that a particular phenomenon
can be perceived or conceptualised in a limited number of qualitatively different

ways [19]. For instance, a study under- taken by Crawford et al [20] identified five different conceptions of mathemat- ics used by beginning university stu- dents. Further, a hierarchical structure was identified in the conceptions. Those low in the hierarchy represented a frag- mented view of mathematics as num- bers, rules and formulae. Higher level conceptions described a more cohesive view of mathematics as a means of solv- ing complex problems and developing new insights used for understanding the world.
A majority of phenomenographic research has investigated aspects of teaching and learning. The concep- tions, perceptions, or levels of under- standing identified have been used by educational researchers in a number of ways [21]. Two are presented here:
Beatty [22] and Pramling [23] used relevant hierarchies of conceptions to determine if learning had occurred. Phenomenography is not a theory of learning, but it does incorporate a view of learning as conceptual change, requiring an individual to understand a phenomenon in a qualitatively different way from the way

it was understood pre- viously [24] .If a student can be shown to have developed a more advanced conception of a phenomenon then con- ceptually significant learning has occurred.

Larrson [5] used reflection on differ- ent levels of understanding to gain a students' perspective of the teaching and learning. This is important as phe- nomenographic studies have shown that the students' perception of the teaching and learning is vital to the learning process [24] .This requires more expla- nation.

Phenomenographic research has shown learning to be a relation between 'how' students learn and 'what' they learn. The 'what' aspect of learning is thought of as a conception. The 'how' of learning is the approach a student adopts to a particular learning context. Marton and Saljo [25] identified sur- face and deep approaches to learning. A deep approach involves an intention to understand whereas a surface

approach signifies an intention to sim- ply complete the task requirements as perceived by the student. The approach students adopt will vary with the learn- ing context and depends on an interac- tion between the students' perception
of the nature of the task and on the stu- dents' prior experience. For instance, if a student perceives that a teacher will only be testing a retention of knowledge at the conclusion of a course and the student has been successful in the past by simply remembering facts, they are likely to apply a surface approach to their learning. Conversely, if a student's intention is to understand the concepts being presented by the teacher and the teacher provides a learning context encouraging understanding, a deep learning approach will be applied.
The 'how' and 'what' aspects of learn- ing are inseparable. Qualitative changes in understanding will not occur with a surface learning approach but may occur with a deep learning approach. For instance, the conceptions of mathe- matics study of Crawford et al [20] iden- tified deep and surface approaches to learning mathematics. A clear relation- ship was established between the learn- ing approach a student applied and the conception of mathematics that was held. Deeper learning approaches were associated with higher level conceptions of mathematics.
If students are to participate in con- ceptually significant learning in IS then the teaching techniques must provide a learning context which the students perceive as requiring a deep learning approach. The phenomenographic research method can provide a students' perspective of a learning context and
an indication of the learn~ng approaches being applied in that context.

THE EVALUATION METHOD

A role played case was used in the introductory IS subject in a post-gradu- ate diploma course. The students taking this course had completed an under- graduate qualification in an area other than information systems or computing. A role played case was presented to the

students late in the curriculum in the form of an assignment worth 25% of
the overall subject result. The intention was to tie together the content of the subject.
The evaluation of the case was designed to address the question 'Was a learning context conducive to concep- tual change perceived by the students involved in the role played case?'. To this end the nineteen students taking the subject were asked, as part of a larg- er questionnaire, to provide a written response to the question 'What purpose do you think the lecturer had in setting this assignment involving a role played case?'. The questionnaire was given immediately after the last of the three interviews with the client. Three researchers participated in the phenom- enographic analysis of the students' responses, attempting to categorise and describe the students' perceptions. The use of multiple researchers is an impor- tant aspect of the validity of the phe- nomenographic approach, ensuring that the categories of perception are derived from the data rather than being imposed by a researcher.

The analysis of the students' responses involved the following steps:
Two researchers read through the responses to gain a feeling for the data.
The researchers then individually
read through the responses again look- ing for the focus .
An initial set of categories of percep- tion was developed by each researcher .
The researchers discussed the differ- ences and similarities in their respective categories as well as the relationship between the categories.
A draft set of categories was agreed upon.
Each researcher classified the ques- tionnaire responses according to the draft categories.
An independent IS lecturer external to the research project was asked to classify the questionnaire responses according to the draft categories.
The three sets of classifications were compared.
Significant discrepancies between the

classifications cast doubt on the accept- ability of the draft categories. Steps 3 to 8 were repeated until consensus on the classifications was reached.
The final draft categories became the product of the phenomenographic analysis process.
The categories of perception were interpreted by the researchers with respect to the research question central to the evaluation.

RESULTS

Four qualitatively different categories of perception were identified. Each cat- egory is described and illustrated by a single student's response.

Perception A: To give Practical Experience of the Interviewing Process in Systems Analysis
To give us a little bit of an idea about how real-Iife interviewing might feel.

Perception B: To give Real-Life Experience of Systems Analysis
I think the purpose of the assignment is to give us the opportunity to experi- ence the preparation and conduct of systems analysis in a real-Iife situation.

Perception C: To give Real-Life Experience of Systems Analysis as a Means of Reinforcing the Theory
To introduce the student to a real-Iife situation on systems analysis.
To reinforce the theory.
To practise interview techniques. To work well with other people.

Perception D: To Develop an
U nderstanding of the Systems Analysis Process
To understand the systems investiga- tion process, the type of problems

TABLE 1 **Classification of Students into the Categories of Percentage**

Category of Perception	Number of Students
A	5
B	2
C	5
D	4

which may be encountered, how to han- dle customers and how to gather the required information.

Three responses were excluded from Table I. In one case it was not possible to distinguish between perceptions A and B and in two cases between A and C. In these three cases the students did not indicate whether their comments referred to the interviewing component of systems analysis or the whole systems analysis process, although two of the three clearly identified putting theory into practice as a purpose of the teach- ing approach (perception C) .

DISCUSSION

Interpretation of the categories of perception

The categories of perception and the hierarchy in which they are presented are consistent with the phenomeno- graphic view of learning and can be interpreted within its framework. In determining the hierarchy in which the categories of perception are presented both the 'how' aspect (approach to learning) and 'what' aspect (concep- tion) of each perception need to be considered. For instance, perception A refers to an approach to learning (using real-Iife experience) and a concept (the interview process in systems analysis) .

Two hierarchical structures can be dis- cerned:

'When considering the 'how' aspect, a structural hierarchy is evident in that perceptions A through D represent a transition from students' perceiving a purpose that requires a surface

approach to learning (gaining practical experience) through to a deeper

approach (gaining an understanding) . 'When considering the 'what' aspect,

perception A recognises only the inter- viewing part of the concepts underlying the teaching approach whereas percep- tions B, C and D describe the whole pic- ture (systems analysis) .

The two structural hierarchies lead to the same ordering of the categories of perception. The relationship between the hierarchies is displayed in Table 2 and then discussed.

Perceptions A, Band C involve the

gaining of experience. In determining the order in which to present these three perceptions the study of Crawford et al. [20] mentioned earlier is relevant. Two of the categories of approach to studying mathematics identified in that study involved practising techniques by doing many examples. In one category the purpose of the examples was for later reproduction of facts and skills

and in the second, as a means of gain- ing a relational understanding of the theory and concepts. The second cate- gory incorporates a deeper approach to learning than the first with a higher likelihood of understanding being achieved. Perception C of the current study (To give Real-Life Experience of Systems Analysis as a Means of Reinforcing the Theory) clearly relates the experience at systems analysis with attempting to understand the theory and should be considered indicative of a higher quality approach to learning than perceptions A and B.

Perception A (To give Practical Experience of the Interviewing Process in Systems Analysis) and perception B (To give Real-Life Experience at Systems Analysis) lack the link to con- ceptual understanding inherent in per- ception C, but perception B can be con- sidered superior to perception A. The phenomenographic view of learning relates a deep approach to study (an intention to understand the content) with a more cohesive view of the con- tent. For instance a student intent on understanding some new material will try to relate the material to previous knowledge and everyday experience in an attempt to organize and structure the content. Perception A (To give Practical Experience at the Interviewing

Process in Systems Analysis) focuses on the task of immediate concern, the interviewing, and does not perceive the greater whole, the systems analysis. This perception is inconsistent with gaining practical experience as a means of understanding the theory and clearly involves a surface approach to learning. Perception B, while incorporating a sur- face approach to learning, at least recognises the whole picture.

Perception D (To Develop an Understanding of the Systems Analysis Process) signifies an attempt to under- stand the concepts under investigation and recognises the core concepts in a cohesive way. Both these interpretations are consistent with a deep learning approach.

Interpretation of the results in the light of the research question

The results indicated that nine out of seventeen students (53%) perceived a learning context associated with the

case which encouraged a deep learning approach (perceptions C and D) .The total of seventeen students is derived from the sixteen students who clearly classified into a particular perception plus the student whose response indicat- ed either perception A or B. To provide a learning context where students attempt to understand the material being presented and relate the new material to the rest of the curriculum is highly desirable. The results of this studyare considered acceptable at this stage of the development of the role played case approach although improvement is certainly possible.

Implications of the research to the teaching approach.

A significant purpose of an evaluation

TABLE 2 Relationship Between Hierarchies Inherent in Categories of Perception

Perception of Required Approach	Perception of Central Concepts	
	Part (interviewing)	Whole (systems analysis)
Surface (practical experience) ↓ Deep (understanding)	Perception A	Perception B Perception C Perception D

which may be encountered, how to han- dle customers and how to gather the required information.
Three responses were excluded from Table I. In one case it was not possible to distinguish between perceptions A and B and in two cases between A and C. In these three cases the students did not indicate whether their comments referred to the interviewing component of systems analysis or the whole systems analysis process, although two of the three clearly identified putting theory into practice as a purpose of the teach- ing approach (perception C) .

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When considering the 'how' aspect, a structural hierarchy is evident in that perceptions A through D represent a transition from students' perceiving a purpose that requires a surface
approach to learning (gaining practical experience) through to a deeper approach (gaining an understanding) .
When considering the 'what' aspect, perception A recognises only the inter- viewing part of the concepts underlying the teaching approach whereas percep- tions B, C and D describe the whole pic- ture (systems analysis) .
The two structural hierarchies lead to the same ordering of the categories of perception. The relationship between the hierarchies is displayed in Table 2 and then discussed.
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gaining of experience. In determining the order in which to present these three perceptions the study of Crawford et al. [20] mentioned earlier is relevant. Two of the categories of approach to studying mathematics identified in that study involved practising techniques by doing many examples. In one category the purpose of the examples was for later reproduction of facts and skills
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↓	Perception B	
		Perception C
Deep (understanding)		Perception D

of a teaching approach should be to generate ideas for the further improve- ment of the approach. The major con- cern highlighted by the evaluation involves the 31% of students classifying in perception A. Students with this per- ception focussed on interviewing as a skill needing proficiency, with practical experience considered the means to achieving proficiency. The interviews were seen as the task central to the teaching approach but the significance of the interviews in the context of a sys- tems analysis was either not perceived by the students or they were unable to express this significance at the time of the questionnaire. This can be explained in terms of the students' lack of prior experience in interviewing a client or producing a systems require- ment document. The students would have expected to come out of the first of the three interviews with the knowl- edge they required to proceed with the systems analysis. When this didn't hap- pen they would have been confused. It is easy to lose sight of the big picture in this case and questions asked by the stu- dents may no longer be of relevance to the systems analysis but may reflect a need to latch on to something concrete in the face of complexity. The purpose of the assignment then focuses on the interview process rather than the sys- tems analysis.

In using the fmdings to improve the teaching approach it is important for the lecturer/tutor to gain and provide feedback to the students on each inter- view session and to continually direct the students' attention to the big pic- ture. This can be achieved through small group de-briefs of each interview session and would be wor.thwhile even when a role played case is used for assessment.

METHODOLOGICAL CONSIDERATIONS

Two methodological concerns need to be considered when interpreting the results of this study:

The possibility of bias in the stydents' responses. The students' perception of the staff member's role in the evalua-

tion will have an effect on the students' questionnaire responses. Two students included responses from the lecturer's point ofview. For example, '...to get a feel for the depth of thought put into questions by each student' and 'to test his teaching theories.' This is under- standable given the many roles a stu- dent perceives the lecturer playing in presenting a role played case study - provider of the theory, assessor, confi- dant in seeking advice on how the inter- view went. Despite the use of techniques in the study to minimise student bias, the closeness of the relationship between the lecturer as researcher and the student can influence responses.

The limitations of a questionnaire as a data gathering tool in phenomeno- graphic research. Questionnaire responses may represent an incomplete perception when students are unaware of the depth of response required or are unable to completely express their perception in a written form. Categorisation and classification of stu- dent responses are likely to be more reliable when the empirical data of a phenomenographical study is collected using open-ended interviews, and responses can be fully probed.

CONCLUSION

The role played case is a viable alter- native to the written case as an experi- ential tool in the teaching of introduc- tory IS development. The role played case overcomes many of the weaknesses inherent in a written case, in particular providing interaction between the stu- dent and the complex personal and social environments associated with IS development. The approach is consid- ered appropriate for large classes of introductory students as most of the role play takes place in small-group tutorial sessions and does not place excessive demands on staff or comput- ing resources.

An evaluation of an implementation of a role played case involving 19 intro- ductory IS students demonstrated that a majority of students perceived a learn- ing context conducive to conceptually significant learning. The encourage-

ment of conceptual understanding by students rather than rote memorisation is considered an essential component of successful IS teaching. Those students who perceived a learning context demanding a surface learning approach focussed primarily on the interviewing task rather than the systems analysis. The phenomenographic view of learn- ing suggests that students with a frag- mented rather than cohesive view of the material being taught will not develop conceptual understanding. A tutor initi- ated, group de-briefing session of each client interview is proposed as a means of making the task oriented student more aware of the larger systems analy- sis picture.

The students involved in this study were post-graduate students with their undergraduate qualification in an area other than IS. Perceptions similar to the ones found in this study could be expected in implementations of role played cases in similar contexts and with larger classes. The results cannot be extrapolated to the undergraduate situ- ation because of the vastly different learning context and prior experiences of the students. Similar research in the undergraduate IS area and comparison of results with the post-graduate area would be of great interest. Further phe- nomenographic research could involve determining if an improvement in the conceptual understanding of a group of IS students was associated with a role played case.

The phenomenographic research approach is an appropriate method for increasing our knowledge of the con- cepts with which students begin and end our courses, the perceptions they have of the material we teach and the context in which the material is present- ed. Improvements in our understanding of these areas are of great importance in further improving IS curricula. Acknowledgment is due to Jennifer Goddard for her assistance with the phenomenographic investigation and to Professor Michael Prosser for help with the interpretation of the results.

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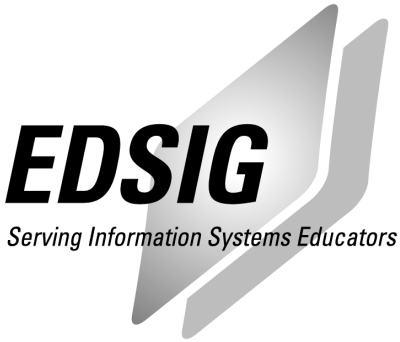

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