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Strategies Pedagogiques de l'Aviseur Didactique ALIMONDE

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Resume: Dans cette communication, nous explorons les possibilites pedagogiques que peuvent offrir les systemes aviseurs didactiques en analysant le logiciel ALIMONDE, un systems aviseur didactique qui a ete developpe a notre Laboratoire. Pour ce faire, nous presentons d'abord la philosophie que sous-tendent les systemes aviseurs didactiques. Nous decrivons ensuite le systeme aviseur didactique ALIMONDE en le situant en EIAO et terminons par une analyse detaillee des strategies tutorielles qui y ont ete developpees jusqu'd present.

Abstract: In this article we explore the teaching possibilities offered by didactic advisor systems by analyzing ALIMONDE, software developed in our laboratory at the University of Laval. Presented first is the philosophy which underlies such systems; we then describe the ALIMONDE didactic system by placing it in the context of ICAI (Intelligent Computer-Aided Instruction), and conclude with a detailed analysis of the tutorial strategies developed for the system up to this point.

INTRODUCTION

Un systems aviseur est un systeme informatique intelligent qui est en mesure d'aider un utilisateur dans l'execution d'une tache informatique qu'il ne maitrise pas parfaitement. L'emploi correct des commandes informatiques (dans un systeme d'exploitation ou dans un systeme d'edition de texte, par exemple) est une tache prototypique pour un systeme aviseur. Il existe cependant une variante du modele de systeme aviseur que nous appelons systeme aviseur didactique.

Ce dernier differe du modele general en ce qu'il aide specifiquement l'usager dans l'accomplissement d'une tache educative. L'usager est alors un etudiant, et il est la, avant tout, pour apprendre. Dans le modele general, au contraire, 1'usager veut d'abord accomplir une tache (effacer un fichier ou etablir des marges) et l'aspect pedagogique n'est que subordonne a cette tache. Voila essentiellement en quoi 1'aviseur didactique diflfere de 1'aviseur usuel.

Un aviseur didactique est un aviseur en ce qu'il observe les actions d'un usager lors d'une tache et cherche a aider celui-ci a apprendre les composantes

de la tache. WEST (Burton & Brown, 1982) est le prototype classique d'un systeme aviseur didactique. II observe 1'etudiant dans sa tache de manipulation arithmetique (cette tache etant imbrique'e dans la tache plus manifeste de gagner au jeu WEST), en deduit les opportunity's d'aide, et active cette aide selon certaines regies d'intervention pedagogique bien precises.

Les systemes aviseurs didactiques peuvent etre consideres a 1'heure actuelle comme etantles systemes d'enseignementintelligemmentassiste par ordinateur (EIAO) les mieux adaptes &. des environnements d'apprentissage informels. En efFet, pour qu'une situation informelle devienne une activite d'apprentissage efficace, 1'ajout d'un guide ou d'un tuteur est essentiel. Le role du tuteur est alors d'observer les decisions de 1'apprenant et d'intervenir au besoin pour le conseiller de facon a 1'amener graduellement vers des strategies qui auront un certain impact pedagogique. C'est en ce sens que le role du tuteur est aussi associe a celui d'un "coach", d'un aviseur didactique.

Dans cette communication, nous explorons les possibilite's pedagogiques que peuvent offi-ir les systemes aviseurs didactiques en analysant le logiciel ALIMONDE, un systeme aviseur didactique qui a ete developpe a notre Laboratoire. Pour ce faire, nous pre"sentons d'abord la philosophie que sous-tendent les systemes aviseurs didactiques. Nous decrivons ensuite le systeme aviseur didactique ALIMONDE en le situant en EIAO et terminons par une analyse detailiee des strategies tutorielles qui y ont ete developpe"es jusqu'a present.

La philosophie des systemes aviseurs didactiques

L'objectif vise" par les systemes aviseurs didactiques est d'encourager 1'acquisition d'habilete"s et de strategies de resolution de problemes en engageant 1'eleve dans un environnement d'apprentissage informel, tel le jeu. Dans une telle situation, le but premier de 1'eleve est de s'amuser et 1'acquisition dTiabiletes en est une consequence directe, mais bien souvent cachee. L'eiement tutoriel consiste alors dans le fait que, ayant observe la demarche de 1'eleve (sa facon particuliere de jouer), 1'aviseur didactique interrompt 1'eleve pour lui fournir un certain feedback ou lui suggerer une nouvelle strategic. Les indications, il les fournit progressivement afin de permettre a 1'eleve de decouvrir lui-meme sa faute: I'erreur est alors dite constructive (Brown & Van Lehn, 1980).

En regard a cette philosophie, les systemes aviseurs didactiques font face & deux contraintes importantes. D'une part, 1'aviseur ne doit pas interrompre 1'eleve trop souvent; sinon il y a risque que 1'eleve ne puisse developper les habiletes necessaires pour examiner sa propre demarche et identifier les causes de ses erreurs. D'autre part, 1'aviseur doit fournir a 1'eleve des commentaires pertinents, sans toutefois lui donner tous les elements de la reponse; cela pourrait, a moyen terme, detruire 1'aspect motivant du jeu ou de la situation d'apprentissage. Le probleme central pour un aviseur didactique est done de determiner a quel moment il doit interrompre 1'eleve et quel sera la nature du message lorsqu'il aura interrompu 1'eleve. D'ailleurs, dans WEST, le premier systeme aviseur didactique *h* avoir ete developpe, une place

importante est accordee a ces deux aspects en ce sens qu'un ensemble de strategies tutorielles ont e"te" mises de 1'avant pour permettre a 1'aviseur didactique de donner le bon commentaire au bon moment.

Description du logiciel ALIMONDE

ALIMONDE est un jeu informatique qui vise a amener 1'eleve a une meilleure connaissance des aliments et a de meilleures decisions au niveau de sapropre alimentation (Duchastel, 1987). Le format, jeu a ete adopte essentiellement pour inciter les jeunes a explorer de facon interessee ce domaine du programme scolaire auquel ils sont exposes des le premier cycle du primaire. Nous croyons que le jeu est beaucoup plus apte a cette tache qu'une approche davantage didactique (Zelman, 1986).

Dans ALIMONDE, 1'eleve deplace un petit bonhomme (qui le represente) dans une foret parsemee de buissons. Sous chaque buisson se trouve un aliment que 1'eleve decouvre en s'y rendant. II doit alors decider s'il prend ou non 1'aliment pour 1'incorporer a son menu, sa tache etant de se composer un menu e'quilibre pour la journee.

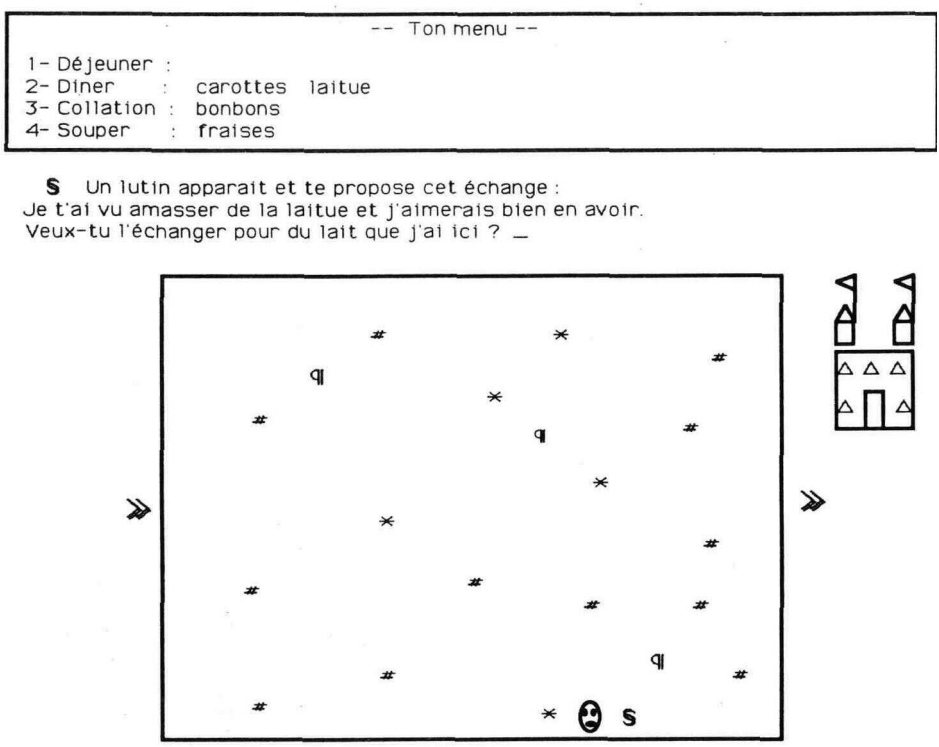
Le but du joueur-eleve est de sortir eVentuellement de la foret afin de se rendre a un chateau (represente egalement a 1'ecran) pour offrir son menu au roi. Pendant le jeu, plusieurs interventions tutorielles peuvent etre activees par le systeme en fonction des connaissances et de la performance du joueur-eleve. Une fee peut apparaitre pour suggerer a Thieve de se de"barasser de certains aliments moins bons pour sa sante. Un lutin peut apparaitre pour proposer un echange d'aliments £ l'e"leve. Une bete peut apparaitre pour questionner 1'eleve sur la nature d'un aliment (son appartenance a un groupe alimentaire). La bete empeche aussi le joueur-eleve de quitter la foret avant qu'il ait un menu equilibre\ Toutes ces interventions tutorielles sont fonction du contexte global du jeu tel que determine par 1'examen du modele dynamique de 1'eleve.

Du point de vue de 1'eleve, interagir avec ALIMONDE est aise. Au debut du jeu, 1'eleve re9oit les instructions qui lui expliquent le deroulement du jeu et lui pre"sentent les diffe"rents personnages qu'il pourra rencontrer. Au cours du jeu, 1'eleve se deplace dans la foret au moyen des cles de fleches au clavier.

Selon les circonstances, I'e'leve doit prendre des decisions concernant la composition de son menu pour la journee. Lorsque Thieve atteint un buisson, 1'aliment qui se trouve sous ce buisson lui est revele et si 1'eleve decide de le prendre, cet aliment est inclus a son menu qui est affiche" en haut de 1'ecran. A tout moment, 1'eleve peut decider de se defaire d'un aliment pris anterieurement. Pour cela, il n'a qu'a se rendre a 1'une des poubelles se trouvant dans la foret pour y jeter 1'aliment. A tout moment, Thieve peut aussi demander 1'aide de 1'aviseur concernant un aliment particulier; 1'aviseur le renseignera alors sur le groupe alimentaire et la valeur de cet aliment (consider^ "bon" ou "mauvais" pour sa sante). Une illustration du tableau de jeu est presentee a la figure 1 (voir page suivante).

Le prototype actuel d'ALIMONDE est operationnel. II est programme en

Figure 1.
Le tableau dejeu de ALIMONDE. en *cours dejeu.*



PROLOG et tourne sur IBM-PC, muni d'une carte graphique. Les connaissances th£matiques d'ALIMONDE sont repre"sentees dans une vase de connaissances distincte. Dans cette base, on y trouve les parametres d'un menu e'quilibre' de meme que les particularite's de divers aliments telles son groupe alimentaire, sa difficult^ pr^sumee au niveau du classement dans un groupe, sa valeur de meme que de elements utiles pour le systeme. La base de connaissances 6tant distincte du programme lui meme, il est facile de lui ajouter de nouveaux aliments (une quarantaine d'aliments font actuellement partie de la base de connaissances). Une partie des connaissances alimentaires d'ALIMONDE apparaissent a la figure *2* (voir page suivante).

L'aspect pedagogique d'ALIMONDE

Comme nous 1'avons deja mentionne", ALIMONDE est un systeme aviseur didactique. II n'enseigne pas 1'alimentation de fafon structuree comme pourrait le faire un systeme tutoriel traditionnel. II n'est pas non plus une simulation informatique ou 1'eleve entre ses aliments pour recevoir une retroaction eventuelle concernant ses choix. N^anmoins, il incorpore certains

Figure 2.
Une partie des connaissances alimentaires de ALIMONDE.

```
/*Les aliments*/

aliment (bonbons, aucun, 3, des, facile, mauvais).
aliment (frites, "fruits et legumes", 18, des, difficile, mauvais).
aliment (carottes, "fruits et legumes", 2, des, facile, bon).
aliment (fraises, "fruits et legumes", 7, des, facile, bon).
aliment (laitue, "fruits et legumes", 12, "de la", facile, bon).
aliment (lait, "produits laitiers", 1, du, facile, bon).
aliment (tomate, "fruits et legumes", 19, une, facile, bon).
aliment (gateau, "pain et cereales", 4, du, facile, bon).
aliment (oeuf, "viandes et substituts", 5, un, difficile, bon).
aliment ("feves vertes", "fruites et legumes", 20, des, facile, bon).
aliment (fromage, "produits laitiers", 6, du, facile, bon).
aliment ("viande hache", "viandes et substituts, 8, "de la", facile, bon).
aliment (pomme, "fruits et legumes", 21, une, facile, bon).
aliment ("cereales seches", "pain et cereales", 9, des difficle, bon).
aliment (yogourt, "produits laitiers", 10, du, difficile, bon).
aliment (pain, "pain et cereales", 11, du, facile, bon).
aliment (poulet, "viandes et substituts", 13, du, facile, bon).
aliment ("creme glacee", "produits laitiers", 14, "de la", facile, bon).
aliment (cretons, "viandes et substituts", 15, des, facile, bon).
aliment (poire, "fruits et legumes", 16, une, facile, bon).
aliment (nouilles, "pain et cereales", 17, des, facile, bon).
aliment ("coca cola", aucun, 22, un, difficile, mauvais).
aliment (saucisses, "viandes et substituts", 23, des, facile, mauvais).
aliment ("oeuf dur", "viandes et substituts", 24, un, difficile, mauvais).
aliment (patisserie, "pain et cereales", 25, une, facile, mauvais).
aliment (tarte, "pain et cereales", 26, une difficile, mauvais).
aliment (olives, "fruits et legumes", 27, des, difficle, bon).
aliment ("jus de pamplemousse", "fruits et legumes", 28, un, difficile, bon).
aliment (riz, "pain et cereales", 29, du, difficile, bon).
aliment (macaroni, "pain et cereales", 30, du, difficile, bon).
aliment (pouding, "produits laitiers", 31, du, difficile, bon).
aliment (poisson, "viandes et substituts", 32, du, difficile, bon).
```

elements de ces strategies, mais dans une situation ou 1'eleve a constamment 1'initiative de la situation, tout en profitant de certains avis relatifs a ses actions.

L'eleve elabore le menu qu'il desire. Cependant, dans certaines circonstances, une intervention tutorielle est activee.

La fee intervient lorsque deux aliments considered moins bons pour la sante, par exemple des bonbons et des frites, sont choisis par 1'eleve. La fee ne fait qu'offrir une suggestion: se defaire de ces aliments. C'est a 1'eleve de decider s'il les garde ou non.

Le lutin, lui, intervient lorsque 1'dleve a a son menu plus que le nombre

normal d'aliments dans un groupe alimentaire particulier. Par exemple, si 1'eleve choisit trois aliments du groupe "viandes et substituts" (deux seulement sont appropries pour une journee), le lutin intervient et lui propose un ^change impliquant 1'un de ces aliments. La encore, c'est 1'eleve qui decide de 1'action a entreprendre.

La bete intervient quant a elle, dans deux circonstances differentes et de facon davantage decisive. Elle intervient d'abord de facon aleatoire pour questionner 1'eleve sur 1'appartenance d'un aliment & un groupe alimentaire. Elle intervient aussi lorsque 1'eleve essaie de sortir de la foret. A ce moment, la bete examine le menu de 1'eleve pour determiner s'il contient le nombre d'aliments appropries pour un menu equilibre". Si c'est le cas, 1'eleve peut sortir de la foret et se rendre au chateau; en cas inverse, la bete lui indique ce qu'il lui manque pour avoir un menu equilibre et le retourne dans la foret pour qu'il puisse poursuivre sa cueillette d'aliments.

En resume, que fait ALIMONDE? II donne une tache a 1'eleve, puis au fil des decisions et des actions entreprises par ce dernier, il donne un certain feedback sur la validite de ces actions. A la toute fin de 1'evenement, il donne un feedback plus direct et plus complet sur 1'ensemble du menu, tel que le ferait une simulation complexe. Or, tout est dans la nature de ce feedback donne en cours de jeu. Dans un jeu simple, nous aurions le couple action/feedback; dans ALIMONDE, le couple implique est davantage un couple situation/feedback. Ce qui est pris en compte pour une intervention tutorielle, c'est la situation d'ensemble (c'est-a-dire 1'etat du menu de 1'eleve a un moment donne) et non uniquement son dernier choix.

L'aide que peut apporter ALIMONDE a un joueur-eleve est done due au fait qu'au fil du jeu, se constitue un modele de 1'etudiant de plus en plus sophistique". En se basant sur la connaissance qu'il a de 1'e'leve, 1'aviseur peut intervenir en activant un principe tutoriel approprie. Les decisions de 1'eleve constitue la connaissance qu'a le systeme de 1'e'leve tout au long du jeu et par consequent, les interventions tutorielles dans ALIMONDE sont activ^es selon 1'etat du jeu, c'est-a-dire en fonction de 1'ensemble des decisions prises par 1'e'leve. Ces decisions sont enregistre"es dans un modele-etudiant dynamique qui est un portrait eVolutif de 1'etat du menu de 1'eleve de meme qu'une trace de ses decisions (voir figure 3, page suivante).

II y a lieu d'examiner maintenant 1'approche pedagogique d'ALIMONDE par rapport a celle de WEST. Des differences sont eVidentes a plusieurs egards:

1) d'abord au niveau de la tache. Dans WEST, la tache consiste a choisir des operations arithme'tiques qui seront optimales pour le jeu. A chaque coup, il y a une option optimale par rapport aux autres. Dans ALIMONDE, cette optimalite" n'entre pas en jeu a chaque coup, mais seulement au niveau de la tache dans son ensemble (celle d'eiaborer un menu equilibre). Ainsi, un eleve peut delaisser un bon aliment sans prejudice (des carottes, par exemple) enautant cependant qu'il prenne plus tard d'autres aliments equivalents (des tomates, par exemple). La tacheest alors dite

Figures.
Le moddle-etudlant de ALIMONDE, en cours dejeu.

```
etudiant ("refuse_au_lutin", "laitue")
etudiant ("refuse_du_lutin", tomate")
etudiant ("choisi", "lait")
etudiant ("donne_au_lutin", "fraises")
etudiant ("prend_du_lutin", "laitue")
etudiant ("choisi", fraises")
etudiant ("choisi", carottes")
etudiant ("jete", bonbons")
etudiant ("choisi", 1rites")
etudiant ("age", "10 ans")
etudiant ("prenom", "Paul")
modele_equilibre ("produits laitiers", 1)
modele_equilibre ("fruits et legumes", 3)
modele_equilibre ("aucun", 0)
 modele_equilibre ("viandes et substituts", 0)
modele_equilibre ("pain et cereales", 0)
modele_valeur ("mauvais", 1)
modele_valeur ("mauvais", 2)
modele_valeur ("mauvais", 1)
modele_valeur ("mauvais", 0)
au_menu ("lait")
au_menu ("carottes")
au_menu ("frites")
au_menu ("laitue")
au_dejeuner ("lait")
au_diner ("carottes")
au_diner ("laitue")
au_souper ("frites")
fee_valeur  (1)
fee_valeur (0)
```

ouverte et le suivi de 1'eleve par le systeme en est rendu plus difficile. Cette difficulte constitue en soi un domaine interessant d'exploration que nous poursuivons d'ailleurs dans le design d'un autre systeme aviseur, oriente celui-la a la tache de modelisation d'une base de donnees (Projet AVISEUR, 1987).

2) puis au niveau du style d'intervention. C'est en fonction du modele-£tudiant global qu'intervient 1'aviseur didactique avec son feedback et ses suggestions. Ces interventions sont cependant deguisees en elements du jeu via les personnages tels la fee, le lutin et la bete. L'intervention tutorielle dans ALIMONDE peut etre qualifiee a cet egard d'intervention "implicite" contrairement a ce qui se passe

dans WEST, ova 1'intervention tutorielle se fait de fapon "explicite". Nous croyons qu'il s'agit la d'une innovation prometteuse, car 1'intervention implicite assure davantage I'inte'grite' situationnelle de la tache: il n'y a plus d'interruption de la part d'un tuteur externe au jeu, il y a simplement deroulement continu du jeu. Le tuteur est cache dans le jeu, tout comme 1'intention pedagogique elle-meme est cached sous le couvert d'un jeu. Un avantage majeur de cette integrity *se* situe au niveau de la motivation: dans la perspective de 1'eleve, il n'y a plus d'interruption du jeu. L'utilisation de cette approche est relativement facile dans une situation de jeu, mais le sera-t-elle dans une situation non didactique (c'est-a-dire avec un systeme aviseur traditionnel)? C'est la une question inte>essante qu'il y a lieu d'explorer dans ce domaine de recherche

Les strategies tutorielles d'ALIMONDE

Examinons maintenant plus en details les strategies tutorielles particulieres d'ALIMONDE, son moyen pedagogique. Elles peuvent etre considered comme un ensemble de regies tutorielles, dont le but est d'aider le joueur-^leve dans la constitution de son menu. Les voici:

1) Etre exigeant: si le joueur n'a pas le minimum d'aliments de chaque groupe alimentaire a son menu lorsqu'il essaie de sortir de la foret, on 1'en empeche (intervention de la bete).
2) Motiver: si le joueur joue deux coups et qu'il n'y a eu aucune inter vention tutorielle, alors on le felicite (intervention de la f§e).
3) Traiter les exces (1): si le joueur accumule plus que le maximum d'aliments permis pour un groupe alimentaire en cours de jeu, alors on lui propose d'e"changer un des aliments de ce groupe pour un autre aliment (intervention du lutin).
4) Traiter les exces (2):-si le joueur inclut a son menu deux aliments qui sont considered "mauvais", on lui suggere de s'en debarasser (intervention de la fe"e).
5) Traiter les hesitations: si le joueur delaisse plus d'une fois des aliments d'un groupe particulier, on 1'arrete pour le questionner sur 1'appartenance d'un des aliments a ce groupe (intervention de la bete).

Ces interventions tutorielles ont pour but d'aider 1'eleve sans toutefois trop contraindre son initiative au jeu. Ainsi, plusieurs fois, 1'aviseur ne fait que sugg^rer une action au joueur, celui-ci demeurant libre de suivre ou non cette suggestion. Et comme nous 1'avons mentionne au debut, trop contraindre le jeu serait probablement d^motivant pour le joueur.

L'avantage d'un ensemble de regies tutorielles de ce type, cet ensemble constituent les connaissances pe"dagogiques du systeme, est qu'il est relativement ais6 de les modifier. Ainsi, si 1'on croit que la fee devrait intervenir

aussitot qu'un mauvais aliment est choisi par lejoueur, il est facile de modifier la regie 4 en ce sens. Cette organisation modulaire du programme en connaissances distinctes permet done une experimentation aisee des strategies tutorielles. C'est la 1'une des promesses les plus excitantes de ce domaine de recherche-developpement que constitue 1'EIAO.

Modifications entrevues pour ALIMONDE

Comme presque tout systeme d'intelligence artificielle, ALIMONDE est en developpementcontinu. Des essaisinformelsd'ALIMONDE avec desjeunes nous demontrent deja certaines limites techniques du systeme, de meme que certaines ameliorations qui paraissent souhaitables. Nous comptons pouvoir bientot experimenter ALIMONDE de facon plus formelle et les analyses de protocole qui en resulteront, seront une aide precieuse dans 1'ajustement du systeme, surtout en ce qui a trait a 1'interface systeme-usager, mais egalement en ce qui concerne les strategies tutorielles utilisees. Nous envisageons aussi d'adapter le systeme ALIMONDE & d'autres matieres du programme scolaire, a le generaliser a d'autres domaines thematiques tel 1'ecologie, les mathematiques et 1'agronomie.

Enfin, nous sommes en train de reprogrammer ALIMONDE en vue de le faire fonctionner sur un appareil Macintosh, ce qui devrait ameliorer la pre" sentation graphique du jeu (elements graphiques plus nets et done plus representatifs) ainsi que la flexibilite d'interaction, ou tout emploi actuel de langage naturel pourra etre remplace par des choix efFectues avec la souris. Cela simplifiera encore davantage 1'usage du logiciel par de jeunes enfants.

CONCLUSION

ALIMONDE constitue une situation informatique destine'e £ accroitre les connaissances alimentaires des jeunes. II est plus qu'un simple jeu amusant. En effet, une facette pedagogique est ajoutee au jeu de maniere a permettre un meilleur apprentissage concernant 1'alimentation.

L'interet d'ALIMONDE est qu'il met constamment 1'eleve en situation de prise de decision face aux connaissances thematiques qui sont impliquees dans le contexte concret du jeu (Duchastel, 1986; Brener & Hajovy, 1987). ALIMONDE force done 1'eleve a une initiative cognitive constante de sorte qu'il doit utiliser ses connaissances de facon appropriee. Cette application appropriee des connaissances thematiques de 1'eleve se developpe de facon graduelle au cours d'une ou de plusieurs sessions de jeu grace *h* 1'intervention du tuteur. C'est en ce sens qu'ALIMONDE repond a 1'objectif vise par les systemes aviseurs didactiques.

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Introductory Accounting on Distance University Education Via Television (DUET): A Comparative Evaluation

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Abstract: The research evaluated the effectiveness of a videoconferenced course delivered from a studio classroom as a method of distance education delivery. Student performance was measured on assignments, examinations, and composite grades. There were three treatment groups: distance, on-campus studio, and on-campus normal classroom. Maturity level of the student was used as a covariate. It was concluded that given the same course materials and the videoconference system, distant students can be expected to perform as well as on-campus studio and on-campus normal classroom students. They also can be expected to perform as well as on-campus mature students. Videoconferencing technology did not adversely affect the performance of on-campus studio students. In this study, it was demonstrated that a university credit course can be effectively transmitted using videoconferencing to provide the same education for mature distant students.

INTRODUCTION

The proliferation of a variety of advanced technologies not previously available suggests some ways in which obstacles to continued professional education can be overcome. Particularly, the combination of cable television service, live television signals, telephone, and audio conferencing bridges into an "educational videoconferencing" service has been used to overcome problems associated with limited access to university courses due to transportation problems, time constraints, or other pressing commitments (Bisesi & Felder, 1986; Carl, 1984; Carver & McKay, 1986; Catchpole, 1985). Through networks such as these, it is now possible to have access to a university education without being in attendance in a campus classroom. Although some work has been done to document and examine videoconferencing exclusively to distant students (i.e., where the professor is alone in front of a camera, has no students in the room, and addresses distant students using television and telephone), little work has been done to examine an adapted classroom presentation, intended to simultaneously serve both on-campus students participating in this studio classroom, and distant students participating via the technology.

There are a number of questions about the effect this kind of delivery

system has on the learners. Some questions relate to the effect of distance education methods in general. For example, the parity of distance education courses with on-campus courses is still debated (Dodds, Lawrence, & Guiton, 1984; Jevons, 1984; Shaw & Taylor, 1984; Smith, Daniel, & Snowden, 1984). Other questions relate to the ability of the videoconference medium to effectively deliver the elements of a university education as well as specific subject-matter areas.

In adapting a classroom presentation for videoconferencing, questions about the effects extend into the on-campus classroom itself. An unresolved question revolves around the impact of the technology used for videoconferencing on the quality of education delivered to both on-campus and distant students. A further question is whether, and if so how, the experience is qualitatively different from the same instruction delivered in a "normal" university classroom (i.e., one which is not enhanced with this kind of technology).

Some authors recommend against simultaneous teaching to both an on-campus and distant group. For example, Parker and Olgress (1980) recommend that in an audioteleconferenced course, no students be in the same room as the instructor, since there is a tendency for the instructor to disregard the presence of the distant students. This appears to have been generalized to videoteleconferencing (Catchpole, 1985), although there is some question as to whether this is appropriate, since more elements of the classroom presentation are available to students than through audioteleconferencing. Blackwell (1984) and Wakshlag (1984) found that the lack of visual stimuli in audioteleconferencing appears to have an effect on the quality of interaction between the instructor and students. The professor teaching in this study found the face-to-face interaction with the studio students helpful in judging student comprehension of the material being presented.

The appropriateness of the face-to-face presentation as the basis for the videoconferenced course has also been questioned. In the majority of instances, separate course and administrative structures have been designed for distance education to by-pass the on-campus structures which have been "problematic" for distance educators (Carl, 1985; Dennison & Robertson, 1986; Jevons, 1984; Harrington, 1977; Holmberg, 1985). Yet, there are economic and organizational factors which make videoconferencing of on-campus presentations worthy of attention. While the on-campus presentation has been labeled inappropriate for distance education, a search of the literature reveals little analysis of the traditional face-to-face presentation for the purpose of preparing it for delivery via technology. Russell and Russell (1983), Tinterow (1984), and Bisesi and Felder (1986) were the few who examined distance delivery of the classroom presentation. No documentation was found to support the conclusion that the face-to-face presentation is an unsound basis for adaptation to distance education using videoconference technology.

In this scheme, the instructor addresses two distinct populations at once during the videoconference. Most distant students are mature and attend

university part-time, while handling other commitments (Feasley, 1983; Holmberg, 1985; Purdy, 1986). The other population, full-time university students (also known as "traditional" students), tends to be younger and primarily concerned with completing a university education. Mature students have generally performed better than traditional students in both on-campus and distance university courses (Browns, 1976; Jevons, 1984; Harrington, 1978). Experience at Mount Saint Vincent University, where videoconferencing is used supports this. Since normally 100% of the distant students at Mount Saint Vincent University are mature, the question arises as to whether the technology has a differential effect on the performance of both mature and traditional students taking these courses.

This paper describes the comparative evaluation of the performance of students enrolled in Business 200: Introduction to Accounting, which was delivered through videoconferencing to distant students, and which had on-campus students in the studio classroom. The same professor during the same academic year delivered another section of this course to an on-campus group in a "normal" classroom atmosphere, so it was possible to compare the performance of these two populations with a third group who received the instruction in this normal classroom.

BACKGROUND

Description of DUET

Distance University Education via Television (DUET) uses one-way videoconferencing to deliver university courses to distant students. One-way full-motion videoconferencing is the combination of a live television signal sent to students at distant locations coupled with a return telephone link to the studio classroom. The television signal can be sent by a number of means: land lines, micro-wave, open transmission, or satellite. DUET uses cable and direct-broadcast satellite to deliver the courses.

The live classroom presentation delivered to an on-campus group is simultaneously delivered to distant students. DUET courses "piggyback" on existing university courses scheduled to be offered on-campus. That is, professors teach simultaneously to the students they see in the classroom and to the distant students. Distant students participate in the class by means of a telephone connected to a teleconferencing bridge, enabling them to talk with the professor, students in the studio classroom, and students at other locations. Distant students complete the same requirements as do on-campus students and work to the same schedules and deadlines.

One-way, full-motion videoconferencing was selected by Mount Saint Vincent University because it enabled the university to reach a distant student population without investing in a separate course or distance delivery structure. Using a standard university classroom modified for videoconference, the existing academic, resource, and administrative structure of the university, it

was possible to deliver distance education economically. Depending on the effect of the videoconferencing medium on the presentations, and on the ability of the distant students to participate using the technologies, the on-campus course is adapted to ensure distant students can a) clearly see and hear the presentation, and b) interact and complete course requirements in ways defined as important to the intent of the course.

Distant students participated in the presentation from their homes or from receiving centres at work. Some students were alone at the site, while others were in small groups. Those in small groups interacted with each other and with the professor.

Distant students interacted with the class using the telephone and teleconferencing bridge to speak with the professor, students in the classroom, and those at other receiving centres. All students were able to interact with the professor after class and during office hours either in person or using the telephone.

Videotapes of all sessions were available throughout the year to all students taught by this professor. On-campus students obtained the tapes through the library. Distant students either recorded the sessions themselves or were sent tapes upon request.

Students were expected to take the class at the time it occurred and to write examinations under the same conditions and at the same time as the on-campus groups. But in some cases, distant students elected to participate in the course primarily through videotape.

The majority of distant students were female and employed in full-time clerical positions. All distant students were mature and were observed to have other commitments. They appeared to fit the profile of distant students described in other studies.

The Effect ofVideoconferenced Distance Education Courses

There are many case and evaluation studies of distance education in general. It has been long-established that the use of televised methods are not significantly different in their educational effects from face-to-face methods (Mielke, 1971; Perrin, 1977). Evaluations of videoconferenced distance courses, however, are difficult to find.

In Canada, most distance education using videoconferencing or the televised classroom presentation has been developed exclusively for a distant student population (Catchpole, 1985; Croft, 1986; Haughey, 1983; Holmberg, 1985). In a few instances, such as distance education at Carlton University, Wilfred Laurier University, and University de Moncton, classroom presentations have been videotaped or sent live over television channels, but have no mechanism for direct interaction of the distant students during the presentation.

A review of the literature revealed few evaluation studies of videoconferenced courses presented to both a distant and face-to-face population. TOTE at North Carolina State University videotapes and distributes classes to

distant students whose progress is not synchronized with the on-campus calendar (Russell, 1984). Russell and Russell (1983) reported an evaluation of language teaching by videotape using the classroom format as the basis for the presentation. The study reported no differences in learning between the group viewing the videotape, and those in the classroom with the instructor during the recording. Of the group receiving the videotape, all reported ease in perceiving the important elements of the presentation. In terms of the experience itself, more than half indicated they did not learn as much as they would have in a regular classroom setting and felt disadvantaged in not being able to ask questions. A strong majority, however, said they would take another TOTE course. All participants in the group in the classroom with the instructor (during the taping) indicated they learned as well as in a regular classroom, and would take another TOTE course. Slightly over half indicated the technology enhanced their learning experience.

Kirman and Goldberg (1982) described a study in which the effectiveness of a videoconferenced course in teacher education was tested against the face-to-face course given to a control group. They found no significant difference between the performances of the control and treatment groups. The authors noted that the treatment group was composed primarily of mature students while the control group was composed of younger, mainly full-time students. Some discomfort with using the videoconferencing technology was expressed by members of the treatment group.

Haughey (1983), in her description of videoconferenced nursing and educational administration courses, limited her discussion to the interactions between instructor and students. She noted that interactions were different: more serious, centered on administrative matters, and more controlled than in the classroom environment. In a related study of the same system, Collins (1983) concluded that the educational effects of videoconferenced courses are comparable to those outcomes achieved in the classroom.

Carver and McKay (1986) described the use of DUET by Dalhousie University School of Nursing. The instructor taught exclusively to a distant student population. Student achievement for this course was comparable to the achievement of students on-campus.

Carl (1984) summarized the findings of pedagogical evaluations for DUET courses taught to both a face-to-face group and a distant population, noting that the performance of distant students was normally equal to, or better than, the performance of the face-to-face group. Some professors informally noted that the average grade achieved in DUET sections (i.e., distant and face-to-face combined) appeared to be higher than that for other sections of the same course taught by the professor.

Most of these studies were concerned with videoconferenced courses delivered exclusively to distant populations. Little attention has been paid to the issue of addressing both an on campus and distant group simultaneously. The effects of the videoconferencing technology on the on-campus group compared to effects in a normal classroom does not appear to have been examined.

Distance Accounting Courses

The literature regarding distance education accounting courses appears scarce. Brown (1976) compared the performance of distant students with that of on-campus students taking introductory accounting from the State University of Nebraska. (Scigliano ,1978, also described the use of this course at Nova University.) The course differed from that described in the present study in that the package was pre-produced, consisting of a mixture of videotapes and other print and non-print media. The Nebraska study compared the performance of three groups: distant students taking the pre-produced course, on-campus students taking the pre-produced course, and on-campus students taking the traditional classroom format. Distant students were allowed to take the course at their own pace while on-campus students were required to adhere to academic timetables.

Brown concluded that the distant learners who completed the course could be expected to achieve as well, or better than, the on-campus learners using the same materials in the on-campus setting. Performance for both groups was comparable to those enrolled in the normal classroom. He also noted that mature learners appeared to perform better than younger students.

The present study differs from this in several respects: Business 220 was a full year, one unit, introductory accounting course. The same course content and format was used to teach all students in the study. The independent variable was the technology. In the normal classroom the technology employed was that normally associated with on-campus teaching (chalkboard and overhead projector). In the DUET classroom (DUET in-class group) the presentation was the same, except that visuals normally viewed on the overhead projector were viewed on the television screens. Students in both these groups participated in face-to-face exchanges with the professor. Distant students experienced the classroom presentation and all visuals through the television. They participated using a telephone line linked into the DUET classroom. All class materials, in-class problems and examinations were the same for both the DUET and normal classroom sections. All students had to meet the same time requirements for completing assignments, examinations and the course itself. Introductory Accounting was a required course for all programs offered by the Business Administration and Office Administration departments at Mount Saint Vincent University. The DUET in-class group and the normal classroom group consisted of approximately equal numbers of Business Administration and Office Administration students. The remainder of on-campus students took the course as an elective (one in the DUET in-class group, two in the normal classroom). All distant students were enrolled in the Business Administration Program. Mature student status is defined by Mount Saint Vincent University to include any individual over the age of twenty-five years or an individual that has not taken a secondary or post-secondary course in five years. This was the definition used for this study.

Using the results obtained by Brown (1976) as a basis, the following hypotheses were generated:

1) there will be no significant differences between the performance on assignments, tests, and final grades between the DUET group and the section taught in the DUET Classroom;

2) there will be no significant difference between the performance on assignments, tests, and final grades between the DUET group and the normal classroom group; and

3) there will be no difference between the performance on assignments, tests, and final grades of students in the DUET classroom and students in the normal classroom.

METHOD

Two separate sections of the introductory accounting course were offered by the same professor during the time of the study. Students chose which section of the course they would attend. Determining factors in the decision appeared to be the time the class was offered, the reputation of the professor, and the availability of the course through DUET. The sessions were taught on the same day of the week, the DUET section in the morning, the normal classroom section in the afternoon. All assignments were subject to identical deadlines and were marked from a common marking key. Midterm and final exams were administered to both groups at the same time in a common test sitting. All groups used the same textbook, and the professor's overhead notes were identical for all sections.

The section which met in the DUET classroom experienced the class through a face-to-face presentation augmented with visuals of accounting problems viewed on television screens placed around the classroom. Distant students were heard over speakers in the room. Distant students experienced the same class simultaneously over television, viewing the presentation and all visuals over the television screen. The rooms where they viewed had a telephone adjacent to the television so the students could be linked into the classroom by telephone. Students in the normal classroom experienced the presentation as normally as would be expected in an on-campus presentation. Visuals were presented using an overhead projector and the chalkboard.

Statistical analyses were performed to compare performance of students in three treatment groups: distance, DUET classroom, normal classroom. Several studies concluded that maturity of the student is a factor in academic success (Brown, 1976; Harrington, 1978; Jevons, 1984; Kirman & Goldberg, 1982). Therefore, maturity was treated as a covariate. A total of eight dependent measures were taken over the entire academic year to enable longitudinal effects to be studied: first semester assignments, first semester midterm examination, Christmas examination, Christmas mark, second semester assignments, second semester midterm examination, final examination, and final grade for the course. The MANOVA allowed partial correlation of these

measures to be used in analyzing the effect of treatment and maturity. This procedure also controlled for the effect of attrition. The Christmas mark and final grade correlated highly with all measures which preceded them, so it was decided to conduct a separate MANOVA for these measures so that differences independent of these two measures could be studied.

RESULTS

Tables 1 and 2 (see next page) show the means and standard deviations for each measure by each treatment group and maturity level. At the beginning of the year, there were 84 observations, 13 of which were distant students, 35 in the DUET classroom, and 36 in the normal classroom. Of the 84, 17 were classified as mature students while the other 67 were traditional students. By the end of the year, attrition diminished the total number of observations to 71: 13 distant students, 26 in the DUET classroom, and 32 in the traditional classroom. The final number of mature students was 16 while the final number of traditional students was 55. Results of the MANOVA indicate that across most of the measures there were no differences between the groups. The specific analyses follow.

On the fall assignments, no significant differences were found between sections, $F(2,66) = 0.03$, $p = .97$. No differences were found for levels of maturity, $F(1,66) = 2.40$, $p = .13$, although the results appear to tend towards significance. Performance on the fall midterm examination did not differ across section nor maturity level, $F(2,66) = .21$, $p = .82$ for section, and $F(1,66) = .90$, $p = .35$ for mature groupings. Differences in performance on the Christmas exam were found between levels of maturity but were not found between sections. For the mature variable, $F(1,66) = 10.03$, $p < .01$, while $F(2,66) = .55$, $p = .58$ for the section variable. In total, across the three measures taken during the Fall semester, one significant difference was found for maturity level on one measure: the Christmas examination. Mature students performed better on the Christmas examination than did the traditional students. While no significant difference was found between sections, it is notable that the means of the distant students and students in the DUET classroom were higher than those of the normal classroom with the exception of the Fall midterm. The means for mature students were consistently higher than those of traditional students across all measures.

Analysis of the Christmas mark, which is an indication of total performance for the Fall semester across the three above measures, seems to support this same trend. Mature students did significantly better than traditional students, $F(1,66) = 7.37$, $p < .01$. No difference in performance was found between sections, $F(2,66) = .45$, $p = .64$.

Analysis of the performance on tests and assignments during the Winter semester showed a decrease in variance between all groupings as the semester progressed. No differences were found between sections or level of maturity on

TABLE 1
Means and Standard Deviations for Sections

Measures	Distant		DUET Room		Traditional Room	
	M	*SD*	*M*	SD	*M*	SD
Fall Assignment	8.32	1.16	7.08	2.41	6.97	2.19
Fall Midterm	69.42	12.27	58.86	21.32	59.81	20.27
Christmas Exam	78.04	11.10	60.31	26.16	59.69	21.84
Christmas Mark	38.26	4.89	30.26	11.48	29.35	11.40
Winter Assignment	6.85	3.92	7.35	1.89	7.04	2.71
Winter Midterm	71.70	23.53	56.94	19.19	57.42	22.89
Final Exam	62.58	37.72	62.94	21.20	61.86	16.55
Final Mark	71.21	19.58	66.62	15.59	63.95	15.93

Note: Distant, *n*= 13; DUET Room, "=35; Traditional Room, *n* = 36.

TABLE 2
Means and Standard Deviations for Maturity Levels and Total Sample

Measures	Mature		Traditional		Total	
	M	SD	*M*	SD	*M*	SD
Fall Assignment	7.97	1.93	7.04	2.23	7.22	2.19
Fall Midterm	67.77	15.81	59.16	20.51	60.90	19.87
Christmas Exam	75.50	22.27	59.52	22.41	62.92	23.19
Christmas Mark	37.02	9.16	29.59	11.03	31.08	11.05
Winter Assignment	7.00	3.59	7.15	2.39	7.12	2.68
Winter Midterm	71.53	21.86	56.46	21.22	59.86	22.14
Final Exam	65.31	30.09	61.54	18.67	62.39	21.58
Final Mark	72.74	18.26	64.37	15.61	66.26	16.49

Note: Mature, *n* = 17; Traditional *n* = 67; Total, *n* = 84.

the winter assignments (F(2,66) = .17, p = .84 for sections; F (2,66) =.04, p = .85 for levels of maturity). Analysis of winter midterm grades reveals a difference for levels of maturity, F(2,66) = 5.64, p < .02, but no difference between sections, F(2,66) =.20, p = .82. No difference in performance on the final examination was found for either maturity level or section (F(2,66) = .62, p = .54 for section, F(l,66) = .25, p = .62 for maturity). As during the Fall semester, a difference was found for only one measure: the winter midterm exam, and for the covariate: levels of maturity. Mature students received significantly higher marks on the winter midterm exam than did traditional students. No differences were evident between sections across all measures.

Analysis of the final grade, which is based on performance on all measures taken during the year, revealed a tendency toward significance for levels of maturity, $F(l,66)$ = 3.23,p = .08, but not between sections,F(2,66) = .33,p = .72. In total, the MANOVA procedure indicates that differences exist between the means of mature and traditional students on both the Christmas and winter midterm examinations, and on the Christmas mark. All three hypotheses were upheld. A graph of the F values for each measure, based on the sequence from first measure to last, demonstrates that differences between levels of maturity were greatest in the middle of the academic year and least at both ends, while variance between sections remained low throughout the year and appeared to have no pattern (see Figure 1 next page).

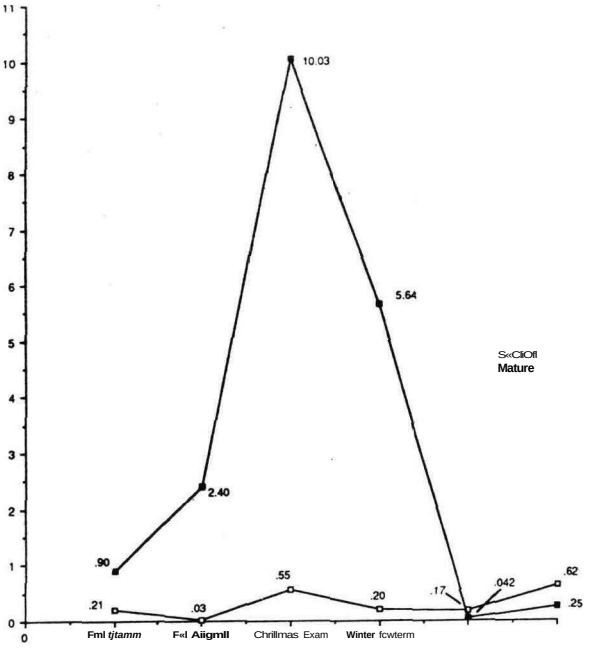
DISCUSSION

No differences in performance were found between the three sections but differences in performance on some measures were found for level of maturity of the student. Distant students, students in the DUET classroom, and students in the traditional classroom appeared to perform equally as well across all measures. Mature students performed significantly better than traditional students on the measures taken during the middle of the year and on the Christmas mark but no difference was found between the two levels of maturity on other measures.

It appears that neither the distant section nor the DUET classroom section were adversely affected by the technology used to deliver the course, as their performance was not significantly different from that of the normal classroom group. While no significant differences were found, the means of the distant student group and the DUET classroom group were consistently higher than those obtained for the normal classroom. This might be attributed to a novelty effect, as this was their first exposure to this kind of course delivery. The decrease in differences between means which occurred during the Winter semester would support this explanation.

An alternative explanation of the decrease in variation between groups as the year progressed might relate to the course content. It was observed that most of the mature students had more previous experience with the content presented through the winter midterm examination than did traditional students. Content treated after that exam appeared to be foreign to both

Figure 1.
Chronological Graph ofF Values for Mature and Section Groupings.



mature and traditional students. Thus, the possibility exists that previous learning acquired by mature students may account for the significantly higher marks on the Christmas exam and Winter midterm. However, this does not explain the lack of variation between groups on the Fall midterm and assignments.

This study appears to indicate that, given the same course materials and the videoconferencing system, students receiving the course at a distance via the technology can be expected to perform as well as students receiving the instruction in a normal classroom setting, and as well as students receiving the instruction in the DUET studio classroom. It would appear that the university credit course developed for on-campus students was effectively transmitted over videoconferencing to provide the same education for both on-campus and distance students.

The materials and presentation for this course were slightly modified from those used in the regular classroom to facilitate video transmission, and to allow distant students to meet the same requirements as on-campus students. No other separate materials were generated for this course. The results of this study seem to cast doubt on the need to develop separate courses and materials specifically for distant students.

Other factors in the DUET videoconference environment were not part of

this study, but may be important in more fully describing its effects. While performance measures were treated in this study, attitudes were not assessed. The acceptability of the course to both distant and on-campus students deserves attention.

The amount and quality of the interactions in the videoconference environment also merit study. The frequency of interaction in the DUET classroom was observed to be less than that in the normal classroom. However, the frequency of personal interaction between the professor and students either face-to-face or via the telephone appeared to be greater than it was in the normal classroom. No records of interaction were kept so analysis was not possible. The question arises as to what effect the technology has on student interaction.

Both on-campus and distant students indicated in discussions with the professor that they used video tapes of the class for studying. The ability to review a class may have provided both an initial learning and a review advantage. While this has not been treated here, the effect of this access deserves attention.

Attrition rates for this kind of delivery system merit study. It was noted earlier that there were no drop-outs among the distant students, nine among the students in the DUET classroom, and four in the normal classroom. Several sources (Feasley, 1983; Holmberg, 1985) indicate that the drop-out rate for distant students is normally higher than that for on-campus students. For this course, the drop-our rate for distant students was the lowest of the three groups while attrition in the DUET classroom was highest. The question is asked whether attrition is related to the presence of the technology or to other factors.

In this study, all sections were taught by the same professor. During the year, there were six other sections of the same course taught by other professors. It is interesting to note that the overall final grade mean for the sections of Introductory Accounting studied approximated the final grade means for the other six sections, which were taught using the same course materials and examinations.

The concept of "piggybacking" a distance education course on the one developed for on-campus delivery is attractive for universities with few resources. The existing course and resource structure can be used with slight modifications to enable professors to teach a broadened student population. In using this structure, integration of distance education with on-campus education avoids some of the problems associated with the development of a separate distance course structure. This study has demonstrated that in one instance, Introductory Accounting over DUET, this kind of integration is pedagogically feasible.

More differences in performance were related to the maturity level of the student. This is consistent with literature concerning the performance of mature students. The question of whether there is an interaction between the technology and maturity level of the student remains unanswered. Since all distant students were mature, analysis of differences due to this interaction

was not possible. It appears to merit further study. The question also remains as to whether the technology has differential effects on different learner populations. Learning style, past experience with technology, gender, and so on, may interact with the videoconference presentation and yield different results for different learners.

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Independent Study Course Development Costs

Clayton R. Wright

Abstract: This article discusses the actual costs for developing independent study print courses for use in learning centres or for distance delivery. It does not provide a general cost analysis model, but presents suggestions to help practitioners design their own guidelines. A resource allocation guidelines is reviewed in detail. The figures are based primarily on one instructional development department's experience within a traditional institution; however, guidelines at other post-secondary institutions are referred to. The $10,000-325,000 cost to develop an independent study course in a traditional institution can be justified financially as well as philosophically.

The economic realities of the '80s have led many post-secondary educators to re-examine the allocation of their monetary resources. The emergence of independent study in traditional institutions has generated concerns about the cost of developing the associated learning materials. Although there is some reluctance on the part of many traditional instructors to implement independent study on a large scale, it is acknowledged that independent study satisfies a number of the individualistic needs of adult learners and distance students, while retaining the academic standards of the institution.

Because it is new to many traditional instructors and administrators, independent study has come under close scrutiny. Interestingly, the cost of developing and delivering traditional lecture courses has rarely been questioned; perhaps this is because the lecture is generally accepted as the standard method of instruction. In order to address the financial concerns regarding independent study, the Instructional Development Department (IDD), Grant MacEwan Community College (GMCC), Edmonton, Alberta, implemented a resource allocation guideline specifically for their independent study course development. This guideline was developed over the last 5 years to ensure a more equitable treatment in the handling of course development projects. Via personal communication, the GMCC IDD guideline was recently compared with cost estimates from other post-secondary Canadian institutions that produce independenfdistance educational material. These institu-

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tions include the Northern Alberta Institute of Technology, the Open Learning Institute, Simon Fraser University, the Southern Alberta Institute of Technology, University of Guelph, University of Manitoba, and University of Waterloo.

Although most personnel at these institutions considered the IDD estimates to be reasonable, the IDD estimates do not represent the actual resource allocations at each institution queried. Variances among estimates are discussed throughout this article.

The resource allocation guideline is used solely as a means of helping IDD estimate the resources required to develop a three-credit, independent study course in a traditional institution. Course delivery costs are not included. The guideline only applies to those projects in which IDD is involved. This guideline is not used in an internal charge-back system. The guideline may not truly reflect the actual costs of course development since such factors as political decisions, lack of funding, and unmet production deadlines can seriously affect the final cost. The resource allocation guideline uses dollar costs as a measure of the resources needed. However, the number of personnel or hours devoted to course development tasks could also be reliable indicators of required resources.

One of the dangers of publishing such a resource allocation guideline is that read-ers may interpret it too literally, rather than use it as a tool for decision making. The duties that GMCC IDD assigns to various personnel, such as instructional designers, may differ from those assigned to designers in other institutions. The figures used to estimate costs are based on IDD's experience and the current Alberta economy, therefore, they may not be applicable to other institutions. Nevertheless, personnel at other institutions have found our estimates to be reasonable. Also, note that the allocations mentioned do not account for employee benefits, possible overtime payments to staff, the effects of employee turnover and absenteeism, or administrative costs associated with supervision or consultation. With these precautions in mind, an explanation is provided for each line of the resource allocation guideline. All costs in Table 1 (see next page) refer to the development of 200-320 pages of course material, a short student guide, and a basic instructor's guide for a three-credit, independent study course. Detailed media production costs are not quoted. The guidelines apply to courses produced to June 30,1988. After this date, they will be revised to reflect increases in compensation, rising material costs, and inflation; allocations may rise by 2% to 5%.

Regardless of what appear to be low allocations for course development, as shown in the guidelines, IDD produces course material of respectable quality. Some of our course material can be found in four Canadian provinces. We are currently developing materials that will be used throughout Canada.

Course Writer /Developer

Depending on the type of development required, the course writer allocations vary greatly. If an independent study course already exists, revisions should cost significantly less than creating a new course. The term "new

TABLE 1
Resource Allocation Guideline for A Three-Credit, Print-Based Course

Function	IDD Allocation* Range	Best Allocation
Course Writer/Developer .		
revise existing independent study course (paid to writer or to provide instructor with 0.5 course release time)	$ 800-1,800	$1,230
produce a text wrap-around course (0.5-1.0 course release time)	1,000-3,500	2,500
convert existing lecture course to independent study (1.0 course release lime)	2,500-4,200	3,600
develop a new course; one not previously offered (2.0 course release lime)	5,000-8,400	7,200
contract for external writers for small portions of a course @ $25.00-$50/hr.		
Course Reviewer/Consultant		
verifies academic content and methodology	1,000-2,500	1,200
Clerical Support		
type or enter drafts and final copy; in-house @ $350/week or external @ $525/week	875-3,150	1,050
type or enter lext wrap-around course materials	500-1,000	600
Copyright Clearance		
payments to copyright holders	1,000-3,000	1,500
Instructional Designer		
revise existing independent study course	600-950	750
produce a text wrap-around course	750-1,500	1,200
convert existing lecture course to independent study	1,050-2,100	1,600
design new course in-house @ $750/week	1,500-3,000	2,250
external contract for design work @ $875-1,250/ week		

(Continued on next page)

TABLE 1 (cont'd.)

Editor		
edit course, including review of one draft and final *copy,* and proofread final paste-up	560-1,700	1,300
rates for small portions of a course: proofreading @ $16/hour copy editing @ $19/hour substantive editing @ $23/hour	—	—
Course Evaluation		
develop and analyze student and tutor questionnaires	0-1,500	800
Media Support		
materials for standard print course; no original art work; preparation of tables, symbols, and so on	125-1,000	350
labour for page formatting and basic graphics @ $500/ week or $3/paste-up for electronically formatted page	600-1,500	1,000
duplicating course materials @ $0.03-0.05/page		
shrink wrapping @ $0.35-0.60/package	—	—
CML question development @ $8-15/item		
video production @ $100-$1,5007 finished minute		
production of most non-print materials	cannot be estimated — requires detailed project information	
Travel Expenses		
expenses involved in researching, assembling course teams, preparing case studies, and so on	cannot be estimated — varies with project design	

"*Note:* This suggested guideline is valid to June, I988. Actual allocations will vary with the complexity of the project and the experience of the individuals involved. Employee benefits are not included in this schedule nor are administrative overheads, rent, or utilities.

course" refers to a course not previously taught at the institution. Developing a completely new course, when lecture notes, handouts, or guidelines are unavailable, is a time-consuming task.

Before a new course is written, an extensive front-end analysis should be conducted. This includes determining the educational gap to be filled (needs analysis), preparing a detailed description of the potential audience, including entry-level skills, and outlining a competency profile of the course or program graduates. Although the allocation for developing a new course ranges from $4,000-$8,400 and varies depending on the faculty compensation agreement, you can expect to pay a course writer approximately $7,200, or the equivalent of a two-course release time for an instructor. This sum may not be paid to th(instructor who is acting as a course writer, but rather to the instructor's classroom replacement. However, we prefer to pay an instructor directly upon the satisfactory completion of specified work outlined in a written contract. This is the same procedure used by book publishers. If the course writer does not conduct a front-end analysis, the time needed to write a new course may be reduced by 20%-25%. This situation arises when instructors in the program are clearly aware of the educational gaps that need to be filled, or when the front-end analysis has been completed for an entire program by an institution's service department, such as IDD or the office that performs research, development, and evaluation.

Some traditional institutions, such as the University of Manitoba, may develop courses that are already offered on campus. Consequently, the existing lecture notes and handouts can be used in the preparation of an independent study version of the course.

In a wrap-around course, a textbook provides the bulk of the learning material. The course writer indicates which sections of the text students must refer to, and provides instructional objectives, additional explanations, and learning activities. The time involved in preparing wrap-around courses can be deceiving, since the writer must carefully read every word in the textbook and identify errors, omissions, and statements that may be inconsistent with the institution's philosophy. In addition, if the textbook is published in a foreign country, writers must generate Canadian examples and exercises to supplement the ones in the text. Although wrap-around course writers can receive as little as $1,000 per course, a $1,800-$3,000 fee is appropriate.

First-time writers of an independent study course may take a longtime to complete their first draft; consequently they may request more money for their assignment than more experienced writers who take less time to write a course. Lack of experience should not be rewarded with additional compensation. This latter point cannot be stressed enough. First-time project managers frequently respond to the emotional pleas of inexperienced, independent course writers who demand additional monies to compensate for their lack of skills. Also, note that good classroom instructors do not necessarily write good independent study material. The first-time writer should be provided with extensive support from colleagues and service departments such

as IDD. If writers do not have a regular block of time to work on course development, or if they are easily distracted by daily operating concerns, the course development time can be extremely lengthy. This may result in a demand for extra funds to complete the course due to the perceived length of time it took them to complete it. Finally, whatever sum is offered for course development, it may never be enough to satisfy some writers. An administrator must carefully weigh each situation, assign a fair allocation to the assignment-at-hand, prepare a mutually agreeable contract for a fixed sum, and then stick to the agreement.

Course Reviewer / Consultant

Course reviewers are hired to perform an academic check of the course writer's work. They should verify that the course is accurate, current, and meets the needs of the learners. Reviewers should complete each student exercise and ensure that the directions and explanations to the student, the student guide, and the instructor's guide are appropriate. At traditional institutions, the course reviewer may be a dean, program head, colleague, or an advisory committee. Normally, these individuals or groups are not paid. They perform course review work as part of their professional duties. Advisory committee members may be paid an honorarium, however. If a new course or program is being developed without in-house expertise, traditional institutions may pay a course reviewer. In this case, $1,000-$!,400 may be an appropriate allocation.

In dedicated, open learning institutions that employ no academic staff, a course reviewer, hired from a reputable institution, performs the crucial verification step. At these institutions, reviewers may be paid $2,500-$3,000 in recognition of their expertise in performing a comprehensive review of the course materials.

Clerical I Word Processor Operator Support

Although more writers are word processing their own text, clerical support is still a vital component of course development. Irrespective of the software or hardware used, a word processor operator converts text from one system to another, makes revisions, and prepares drafts and final copies. Inexperienced independent study course writers generally produce several drafts. Consequently, the word processor operator may take 5-7 weeks to complete the work. If revisions are minimal, 3-4 weeks are usually sufficient.

Costs for clerical support vary depending on their source. You can pay substantially less for the same service, on an in-house basis, than if you contract an external agency. For example, IDD pays Edmonton agencies about $15 per hour for a typist or data entry operator. The agencies receive 30%-50% of the hourly charge, however. Consequently, the employee receives $7.50-$10.00 per hour, or $263-$350 for a 35-hour week. If an in-house typist receives $350 per week, 3-4 weeks work would cost $1,050-$!,400, whereas an agency typist would cost $1,575-$2,100. IDD usually allocates $1,050 for clerical support.

Copyright Clearance

This budget item is receiving more attention as the number of copyright infringement disputes increase. Every institution contacted is, or intends to allocate, sums for obtaining copyright clearances. A few institutions avoid budgeting for copyright; they maintain that copyright is the course writer's responsibility. However, institutions may be liable for copying and distributing works which contain material that has not received appropriate copyright clearances.

If an institution pays a writer or a team of writers to develop a course, usually the institution holds the copyright of the course. Therefore, the institution must ensure that copyright clearances have been obtained. IDD budgets $1,500 per course for copyright clearance. However, about 35% of the courses do not need this allocation. Based on discussions with other institutions, $2,000-$2,500 might be more accurate, especially in English and health science courses.

Instructional Design

Since instructional designers assume various roles in different institutions, it is difficult to calculate an allocation that is generally acceptable. At some institutions, the designers are considered to be the project managers and handle about five courses a year. In GMCC IDD projects, the course writer or program head assumes the role of project manager. Thus, the academic department retains overall control — a characteristic of traditional institutions. In addition, IDD cannot afford to assign only five, three-credit courses to each instructional designer. The GMCC IDD instructional designers often assist the project managers and nurture their project managerial skills, but the designers are not the legitimate project managers.

Several institutions employ instructional designers as editors. While IDD asks designers to do basic copy editing and proofreading, the duties of instructional designers and editors are separate. Most of the substantive editing is left to professional editors for several reasons. First, since instructional designers are expected to handle more than five projects, time for them to do a thorough, substantive edit is inadequate. Second, editors provide a dispassionate view of the material. They have no ownership attached to the original material, as do the designer and the course writer who have worked closely with the material from idea to inception. In this situation, editors tend to see only what is there, not what is supposed to be there. Although IDD designers are expected to have training and experience as instructors, learning theorists, media experts, and instructional designers, they may not have the skills of a professional writer or editor.

IDD allocates about $2,250 for an instructional designer to work on a new three-credit course. IDD fully realizes that this allocation should be higher, especially if designers are working with faculty who are unfamiliar with the development of independent study courses. This allocation does not include the time spent coordinating a large project or setting up a system to manage an

independent study program. If the instructional designer allocation was increased, concerns about the cost of course production would be raised and fewer, high-quality independent study courses would be developed with IDD's expertise. (Many traditional instructors resist the instructional designer's help until they have worked with a designer for a period of time.)

Two other aspects of IDD's instructional designer allocations must be mentioned. First, although it is encouraged, IDD designers are not required to teach in an academic department or to conduct research. Consequently, all their energies are focussed on their instructional design projects. If those institutions who calculate their instructional design costs at $7,000-$12,000 per course, subtracted the sum associated with these extra duties, and divided by the number of courses actually completed, their design costs per course may be significantly less. Generally, in-house designer costs for large projects are 30%-45% of the writer's fee, providing the writer has some experience in writing independent study courses or in dealing with distance students. Secondly, IDD designers are currently regarded as non-academic staff and do not receive the equivalent salary benefits of academic staff.

Editor

Depending on the project's requirements and their experience, IDD editors are generally paid from $16-$25 per hour. Usually, it takes 2-3 weeks to edit as well as proofread the drafts and the final copy of the course. The amount allocated to editing primarily depends on the experience of the course writer. If a course writer is new to independent study or lacks suitable writing skills, the editor will play a vital role in shaping the material. Since this shapingtakes time and requires an experienced editor, the allocation for editing will increase.

Course Evaluation

Course evaluation usually consists of monitoring the assignments and tests from the first cohort of students, analyzing student questionnaire responses, and obtaining the "gut" reactions of the course development team. Generally, if a professional team is assembled to create a course, the final product should require only minor alterations. Major course revisions normally occur every 3-5 years.

Unless innovative delivery strategies or technologies are used, or an external agency makes a request, an elaborate scheme is not generally used at the college to evaluate new course material. The average cost of course evaluation is usually $500-$!,500 or 1-2 weeks work. It may only require the collection and organization of questionnaire data collected via IDD's standardized formative and summative evaluation sheets. Occasionally, on-site interviews with students and instructors are conducted. If an entire program is being converted to independent study, an extensive formative evaluation activity may be planned. This latter activity may cost several thousand dollars depending on how many students are involved and whether one-on-one interviews are to be conducted throughout the province.

Media Support

Estimating media production costs is a fine art, especially if the content, study skill level (cognitive, psychomotor, or affective), and course delivery strategies are unknown. Consequently, media production costs will not be quoted; they might be best discussed in a follow-up article.

Increasingly, the GMCC Media Services Department has become involved in producing print material for independent study courses. Labour and material costs for a standard three-credit course, as indicated in Table 1, are surprisingly low. Due to the inclusion of many graphics in health sciences and technical courses, graphic costs may be substantially higher than indicated in Table 1. Note that graphic artists may charge between $12-$50 per hour. Over time, as the sophistication required for producing quality print materials increases, media production costs will rise. This hypothesis is based on information received from other Canadian institutions. One institution estimates that it costs $15-$20 to produce a finished page of course material.

Most traditional institutions simply word process and duplicate course materials, while dedicated distance institutions tend to typeset and offset print their courses. The latter production methods are more costly, but they usually result in a very attractive package. Increasingly, desktop publishing and electronic typesetting equipment is being used to produce course materials.

Some Observations

Based on the information in this article, each print-based independent study course may cost between $10,000-$25,000 in a traditional institution; occasionally, a few cost as little as $7,000 each. The general range of costs would be substantially higher if courses are supported with high-end technologies such as CML/CAI or video productions. For example, Susan Bell-Rempel at the Northern Alberta Institute of Technology recently reported that it costs an average of $9 per item to develop higher level cognitive test questions. According to Peter Von Stein at the Southern Alberta Institute of Technology, the cost to develop application and problem-solving questions in health sciences may be as high as $15 per item; a few items may cost as much as $30 to develop. Based on the IDD experience, this average item cost would cover item writing, editing, data entry, item reviewing by two reviewers, and alpha testing. At least 800-1,000 CML questions should be created for a three-credit course; therefore, a minimum of $7,200-$!0,000 must be allocated for CML question development. Video productions cost $100-$!,500 per finished minute, and videodisc production costs may be substantially higher. Conversely, course development costs are lowered when inexpensive technologies such as audiocassettes are used, and when experienced independent study course writers, who word process their own text, are employed. The University of Guelph successfully minimizes media costs by employing audiocassettes and microfiche in their independent study courses. Dedicated open learning institutions tend to have substantially higher development costs than those

oulined in this article. They may employ large course development teams, hire well-known course writers to prepare courses, produce multi-coloured, typeset print materials, and incorporate sophisticated technologies in their course materials.

As previously mentioned, course allocations vary from project to project and from locale to locale. They also vary with the type of client. IDD in-house rates can be 20%-75% below the rates charged by professional agencies who contract with business and industry for the same type of course development work. For example, the Freelance Editors'Association of Canada suggests a rate of $18-$30 per hour for copy editing in the Toronto area, while IDD generally pays $19 per hour for the same work. If IDD accepts an external contract, these clients may be charged more than quoted in Table 1. This difference is used to cover the cost of external contract personnel, the actual cost of instructional designer assistance, and the overhead charges, such as administration fees, long distance telephone calls, and so forth.

Are the course development costs outlined in this article reasonable? Can educational institutions justify these expenses in times of financial restraint? These are difficult questions to answer. Institutions must examine the comparable figures for developing their lecture-or computer-based instruction courses and weigh the merits of independent study course development. In addition, it is important to remember that an institution's current political climate will also affect the cost of initiating any educational activity.

From a financial point of view, developing independent courses can be justified only if there is a large student population for the course, and/or the course materials have a shelf life of 4-7 years. Unfortunately, courses in such areas as health sciences not only need constant updating but also major revisions about every three years. Irrespective of the student population, the course development costs are the same. Nevertheless, if the potential student population is large, more funds can be budgeted for course development. Collaborating with other programs or institutions minimizes the financial burden on a specific program or institution. Cooperative projects not only reduce individual institutional costs, but also help to solve the problem of inter-institutional transfer of credit and territorial competitiveness.

Philosophically, there is justification for spending money on course development if an independent study format permits educational access to students who could not otherwise attend a traditional class, addresses the various learning styles of students, shortens training time, and/or increases faculty awareness of individual student needs.

Conclusion

Over the next year, IDD course development costs will continue to be monitored and the resource allocation guideline appropriately altered. Two software packages, Timelines and the Harvard Total Project, will be used for this activity. Both provide the means to manage tasks, timelines, and costs.

If you are interested in a theoretical or mathematical model for determin-

ing course development and distance delivery costs, refer to the references listed below.

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Using Pilot Projects to Train Staff in Instructional Development Agencies: A Videotex Example

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Abstract: The proliferation of high technology that can be used in instruction places new burdens on instructional development agencies and their staffs. In order to function efficiently in their professional capacities, what should development personnel know about high technology and how should they find out? Pilot projects provide one approach to answering these questions. Recently, staff of the Center for Instructional Development at Syracuse University embarked on a pilot project intended to explore the instructional potential of videotex — a delivery system new to the agency. The project provided staff members with an opportunity for professional growth, helped answer important questions about the available videotex system, and suggested general benefits to the agency of this and other pilot projects.

Today's new technologies offer an exciting and welcome chance to recast education and training. Options for individualizing instruction or providing distance education on a real-time interactive basis are increasingly more powerful. Keeping up with each new technology that has potential educational use imposes a special burden on instructional development agencies whose developers must become familiar enough with the technology to make decisions about its suitable educational application. Because of their higher relative costs and complexity, however, the use of the new CD, video, and telecommunication technologies imposes special burdens on the budgets and human resources of instructional development agencies.

Pilot projects are one means for addressing the staff development problem. For the purpose of this paper, the term "pilot project" refers to a project whose scale is reduced in some aspect: breadth, or depth, or implementation, or some combination of these. The particular project described here was limited mostly in implementation in that the final product was not used by students.

This paper uses a videotex-based project as a vehicle for discussing the staff development potential and subsequent agency benefits of pilot projects. Videotex is a computer-based, two-way communication system capable of sending print and graphic information over telephone or cable lines. Although the focus of the paper is on using pilot projects for staff development,

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the paper also provides some appraisal of videotex as an instructional delivery system.

This paper begins by elaborating on the concern about staff development in today's high technology environment and the role that pilot projects can play in addressing this concern. Next, the paper outlines the process followed in this particular project, describes the videotex pilot, and discusses what we learned through the project. The paper concludes with a discussion of the costs and benefits of the pilot project approach.

THE BURDEN ON AGENCY AND STAFF

Financial costs associated with newer technologies like computers, interactive video, and telecommunications often make access to them very difficult. The initial costs of equipment and essential support items are expensive, and maintenance costs use a high share of budget dollars. The dollar cost is, however, only part of the burden new technologies impose on instructional development agencies.

Human resource costs also run high. Instructional development and training staffs need to become familiar with the new technologies in order to make intelligent decisions regarding their appropriate application. Developers have always had to keep abreast of new technology. The introduction of programmed instruction and educational television are just two examples of once new technologies with which instructional developers and trainers had to become familiar.

Because of their complexity, the costs in time and effort in learning to use and appropriately apply the new technologies are now higher than they were in earlier eras. Moreover, the new technologies can be variously combined to form additional kinds of instructional delivery systems. For example, a computer plus a video disc system provides computer-assisted interactive video; a video system combined with telecommunications enables video conferencing; a computer joined with telecommunications forms a videotex system. This combining factor compounds the learning costs.

What Must Developers Know

Undoubtedly, the new technologies offer very powerful instructional delivery systems, but their appropriate use demands new understanding and new skills on the part of the staffs of instructional development agencies. In addition to acquisition, support, and maintenance costs, therefore, agencies are faced with time and effort costs as staff skills are upgraded while the customary level of agency services is sustained.

One significant question is, "How much technological expertise must an instructional development staff acquire in order to function effectively as proactive professionals on high-tech projects?" Some may reply, "None," since a clear characteristic of high-tech projects is the need for a team of specialists

consisting of content experts, instructional developers, and people whose skills are relevant for the technology being used. Can professionals afford to be passengers? It is unlikely. Shatzer and Callan (1986) found it necessary to create a special training program for course developers designing instruction for computer-based training. Personal experience in creating video and computer- assisted interactive lessons also indicated the need for some knowledge about these delivery systems on the part of instructional developers. But how much knowledge is needed to work effectively with a new technology?

In working on any project, instructional developers must be able to communicate effectively, exercise judgment, and make decisions about all aspects of the project. It seems, therefore, that the development staff at least needs a working knowledge of the basic vocabulary used to talk about thr; technology. The staff also needs an understanding of the new system's capabilities and limitations, especially as they relate to instructional design principles and practices. Lack of vocabulary inhibits meaningful communication. Lack of knowledge about the technology's capabilities and limitations precludes being able to judge its suitability for delivering instruction in a given situation. For example, if high quality graphics are critical for instruction, then a microcomputer system capable of displaying only stair-step graphics would not be the delivery system of choice.

Beyond this rather obvious level of familiarity, however, what ought instructional developers know about a particular technology with which they need to work? Key variables likely include the economies of the system, user appeal, the steps for implementing instruction on the system, ease of updating, maintenance factors, and the time required to design and produce lessons for the system.

A companion question as to how much developers need to know about a new technology is, "How can the needed knowledge be acquired?" Some useful information can be gained through reading, personal communication, and attending conferences and workshops. Helpful as these approaches are, the full reality of all that is involved in working with a new technology does not become apparent through them. Pilot projects, whose benefits are widely recognized in many fields, expose developers to the specific requirements of a new instructional delivery system (Florini, Craig, Hugo & Spuches, 1987; Moore, 1986).

The Value of Pilot Projects for Instructional Development Agencies

Pilot projects help reveal how much instructional developers must know about a technology in order to use it effectively. Specifically, a pilot offers five distinct advantages for instructional development agencies:

1) it allows assessment of the strengths and weaknesses of the tech nology without committing substantial staff time and other resources;

2) it avoids involving clients in a project before the development staff is comfortable with the new medium;

3) it helps illuminate any special demands the medium might make on the development process;

4) it minimizes the use of expensive outside experts; and

5) the pilot provides an opportunity to identify critical logistical concerns relevant to the particular technology. A previous pilot project enabled our development staff to identify important factors related to computer-assisted interactive video instruction.

Thus, when an opportunity came to explore the instructional potential of videotex, a pilot project seemed the best means for doing so. A discussion of the benefits and costs of the videotex project follows the description of the pilot.

THE VIDEOTEX PILOT

Videotex services first appeared in 1976. Application of the technology has grown steadily, with much of the development work occurring in Britain, Canada, France, and Sweden. Although some educational uses have been made of videotex in the United States, more extensive application has been made elsewhere. For example, twelve Canadian universities are using Tendon" — a system noted for high quality graphics — to deliver courses in physics, biology, language arts and journalism (Olson & Minor, 1987; Pfaehler 1985). Issing (1986) suggests a variety of other educational uses for videotex.

Syracuse University acquired a videotex system through a grant from A.T.&T. At the present time, the system is primarily used by students to retrieve information of interest to the campus community (Hezel & Miller 1986). The presence of a videotex system on campus provided the staff of the University's Center for Instructional Development with an opportunity to investigate the use of videotex as an instructional tool. Having seen the high-quality graphics, the richness of color, the easy combination of text and visuals, and the interactive potential of the system, videotex looked like a promising instructional delivery system. A pilot project seemed the best way to explore its potential.

At the time of this project, our agency consisted of two professional instructional developers and three graduate interns. With our other project commitments, the staff felt we could not afford to have everyone actively participate in the videotex project. We decided to directly involve two staff members. The others would benefit through staff reports and demonstrations.

In selecting the subject matter for the pilot, we felt it important that the videotex pilot reflect an appropriate use of the technology. After some discussion, we chose to design a short unit on applying additive color theory in black and white photography, a content area familiar to one of us. We believed that the lesson represented an appropriate use of the technology in three ways.

First, the effects of using different color filters to enhance black and white photographs could be demonstrated easily. Second, the high resolution color graphics of the videotex system readily permitted illustrating the relationship between complementary and primary colors. Third, students could practice applying the principle of additive color theory within the instructional unit.

The project team designed the lesson, following the instructional development model used at CID (Diamond, Eickmann, Kelly, Halloway, Vicker & Pascarella, 1975). To gain proficiency with the videotex system, one member of the staff swapped services with an experienced videotex programmer, also called a frame creation artist, who produced material for the campus videotex information service. In return for being taught how to program the videotex system, the staff member created some materials for use on an informatior system.

The final design document consisted of a detailed storyboard of the complete lesson. In order to transfer the lesson to the videotex system, our now-trained staff programmer had to create a series of videotex frames on the system. We chose to produce representative portions of the storyboard. This maximized our resources while giving us experience with as many unique message design problems as possible.

We then asked the more experienced frame creation programmers to evaluate the completed segments. Suggested improvements were incorporated into revisions of the lesson. Next, the completed lesson was shown to a content specialist in black and white photography who checked the accuracy of the lesson and gave additional insights into how the videotex medium might be exploited. Finally, we met with the rest of the development staff to diffuse what we had learned and to discuss its implications.

What We Learned about Videotex from the Pilot

The experience of designing and producing the pilot unit provided a clearer understanding of the potential of the University's videotex system for delivering instruction. The experience also helped illustrate what developers should know about videotex in order to design effective instruction for the system. In addition, we were reinforced in our belief in the value of pilot studies as a means of exploring the instructional potential of new technologies.

The decision to have a development staff member acquire sufficient programming expertise to create all the needed on-screen frames let us make our own judgements about the capabilities and limitations of the videotex authoring language, also called the frame creation software. It is possible to do simple things quickly with the A.T.&T. software. On the other hand, it requires substantial time to learn the language well enough to produce an instructional unit requiring certain types of graphics and branching options. About 60 hours were needed by the staff member, who had prior computer programming experience, to become proficient enough with the system to create the photography lesson. Because of its nature, the lesson included many graphics. It became obvious that creating good videotex lessons requires more than

proficiency with the frame creation software. Creating graphic frames requires many of the skills of a graphic artist in terms of choosing colors, placement of objects and text, and construction of objects.

Acquiring the level of software and graphic expertise needed for a major videotex instructional project does not represent a good investment of the time of the development staff. Their time should be used employing their special professional skills. At the same time, some degree of proficiency with the software facilitates communication with the frame creation specialists. Software proficiency also enables the development staff to form reasonable expectations for the quality of the frames, the amount of time needed to create good frames, the speed with which actions can occur, and the extent of the branching capabilities the system offers. Being able to produce a small instructional unit of about 20 frames on the videotex system would strengthen developers' ability to communicate and to make more sophisticated judgements regarding use of the system.

Producing the photography lesson also helped us identify some of the idiosyncrasies and limitations of the available videotex system for delivering instruction. These include the piecemeal appearance of individual frame components, branching restrictions imposed by the software, and limited animation possibilities. The pilot also suggested strategies for working with the system more effectively. For example, it is possible to take advantage of the piecemeal appearance of frame components to focus learner attention by having certain image components appear first or last. Also, if a series of frames shares a number of image components, the common elements need not be redrawn with each new frame. The result is a faster presentation.

The staff also identified important questions that would have to be answered were the videotex system to be used for real instructional purposes. These include questions as to how many people could use the system at one time, its security features, the transmitting costs, system maintenance factors, and how much down time might be expected. Finally, the pilot helped us to evaluate videotex as an instructional delivery system.

Some Conclusions about Videotex as a Delivery System

Videotex is a suitable means for delivering instruction under some circumstances, but the systems are very expensive, and telecommunication charges are high. Because of this and the availability of other technologies than can function rather similarly, we would not invest in a videotex system just to deliver instruction. (In fact, given the continuous development in computers, software, and telecommunications, it will be interesting to see if videotex retains a separate identity.) As a delivery medium, videotex has attributes similar to those of computer-assisted instruction, with its associated strengths and weaknesses. That is, a videotex system is costly in terms of hardware, software, and the human resources needed to design and implement the instruction. Also like computers, the power of videotex permits the inclusion of design features not readily available in noncomputer-based instructional delivery systems.

Although we would not purchase a videotex system to deliver instruction, using an existing in-house system for training and instruction is another matter. In addition to use by colleges and universities, agencies like hotels, convention centers, transportation centers, and corporations might find it cost-effective to use their videotex systems for some kinds of staff training. Few agencies, however, seem to use their videotex systems for this (Bacsich, 1984). Why they are not used may be an interesting avenue for future exploration.

THE PILOT PROJECT'S BENEFITS AND COSTS

The primary purpose of the videotex pilot was to foster staff development and in this, the project was successful. The project team gained a considerable measure of confidence working with videotex, acquired a working vocabulary of the technology, developed skills in using it, and formed a richer concept of videotex. The pilot helped clarify the capabilities and limitations of the available system and set a level of expectations regarding the appropriate use, function, and appearance of any future instructional products for the videotex system. Other staff members benefited from the pilot through staff reports and demonstrations.

From a management perspective, the pilot project resulted in some general benefits for our agency. These include:

1) being able to make more knowledgeable judgements about the appropriate use of the videotex technology and the costs of using it;

2) having credibility with clients when discussing the system;

3) being better able to manage future videotex projects;

4) having some basis for estimating project costs; and

5) increasing the value of our agency to the university because of enhanced staff capabilities.

The biggest cost of the project was the increased work, which was undertaken without a reduction in other responsibilities. But there was another cost. Because this particular pilot was intended solely for in-house staff development, it was difficult to sustain motivation and to meet self-imposed deadlines. This motivational problem was not a factor in an earlier pilot project where the resulting product was used immediately in a classroom. Although acknowledging the motivational issue, we feel that the general benefits of pilot projects justify the effort expended on them even when the product has no immediate use.

CONCLUSIONS

In order to make appropriate use of videotex and other new technologies, it is important that instructional developers have some knowledge about the individual technology and some skill in using it. Pilot projects are an excellent way to gain a reasonable degree of knowledge about and skill in evaluating, using, and managing new technologies, thus helping instructional development agencies cope with the burden of keeping up with them. The experience also builds staff confidence regarding the use of new technologies — an important asset in a rapidly changing field. In general, pilots should be low risk, provide maximum hands-on experience, and be related to realistic instructional problems.

We will continue to see the rapid emergence of new technologies; many will have educational potential. Pilot projects offer instructional development agencies and staffs a powerful staff development vehicle and an evaluation tool for assessing the reality of that potential.

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Book Reviews

Rose Bene, Editor

An Attributional Theory of Motivation and Emotion, by Bernard Weiner, New York, NY: Springer-Verlag, 1986, 304 pages.

Reviewed by Gilles Carrier

Attribution theory, quite prevalent in recent cognitive psychology, is concerned with the study of perceived causation. Heider (1958), Kelley (1967) Jones and Nisbett (1971) and Ross (1977) have been the main authors in this field. This theory explains goal orientations by personal (dispositional) or impersonal (situational) causes. Motivation has also been studied in the light of personal causation by cognitivists such as Atkinson and Feather (1966), Rotter (1966) and de Charms (1968). Adult education and distance education may very well be interpreted from this perspective, especially in understanding how students and teachers interact in their pursuit of academic achievement.

Bernard Weiner has published articles and books on cognitive motivation since 1970 and has all along emphasized the stability factor as a stimulus reinforcer, in personal reactions to goal expectancy. This new book presents a general theory of attribution where perceived stability of goals and causes is studied as a central theme. Weiner's basic argument is that the motivation to perform or to continue to perform an activity is closely linked to the actor's perception of the determinants of success. A stable reinforcer, as the assistance of a physiotherapist in a training session for a disabled person, (or as any teacher assisting pupils in a classroom) will enhance motivation for achievement and related pleasurable emotions.

In cognitive psychology, perceptions of events and stimuli confirm expectancies accumulated through previous experiences and are translated into attributions. Goal orientation is one such important attribution in situations where achievement is pursued. From 1958 to 1982, authors explained individual evaluation of the required level of ability, or of effort, or by good and bad luck. One main theory (Atkinson & Feather, 1966) explained achievement

needs by the probability of success or failure a subject would attribute to an expected event. Another main theory, the "social learning theory," with J. B. Rotter (1982) as a central proponent, explained differences in individual reactions by personal characteristics. The theory refers to persons more influenced by external control such as powerful others or chance situations, more inclined to aggregate in social gatherings and to rely on affiliative needs. The theory also refers to more autonomous personalities relying on their skills or abilities to achieve success.

Both of these theories agree that high achievers have common characteristics, whereby they would be more independent and regard their own contributions as more prevalent towards success than the influence of external factors. These theorists could not agree, however, in their explanation of failures. For Atkinson and others, low achievers attribute failure to the difficulty of the task, but would demonstrate a tendancy to repeat their attempts at difficult tasks. High achievers, on the other hand, would rationalize their reactions and usually choose moderately difficult tasks. For Rotter and colleagues, reactions to failure or success would be explained by the level of externality or internality of people; external people being more tolerant of failure.

The limitation of these theories when tested in a wide range of age groups and cultural environments was finally acknowledged at the end of the seventies by Weiner (1979) and other cognitivists. Results of Thematic Apperception tests (Atkinson) or of the application of Rotter scales were frequently nonsignificant with similar groups in different environments. For Weiner, in particular, this is not only due to instrumentation, but is primarily due to faulty research methods.

A large number of psychological causes may be apparent for cognitive searchers, but, for Weiner, expectancy shifts tend to be predominantly caused by the perception of stable stimuli. Factor analyses and multidimensional scaling methods are used to arrive at a parsimonious model, pointing to the prevalence of stability as a closely related factor to controlability in perceptual behavior. Weiner's conclusion is important and it is central in causality theory. It has affiliations with K Lewin's theory (1935) on levels of aspiration and with Tolman's anticipation theory (1932) of expected results in humans. It relies on new modes of investigation, such as coding of written materials from newspaper articles, business reports, letters, personal journals, or coding of verbalizations during and after task engagement, and as indirect attributional indexes, free recall of previously read material and sentence completion. These methods document spontaneous attributional activities.

Relations between emotions and motivation in situations of success or failure are also explored at great length. The author stresses the fact that individuals are more likely to take responsibility for successful outcomes and to blame negative outcomes on external factors. Emotions like pride, happiness, gratitude, anger, pity, guilt, and shame are associated with perceptions of outcomes and must be included in a comprehensive theory of attribution.

The important implication of this approach, in which causal thinking and feeling form well-established and robust laws, is that people can be reasoned out of their anger, guilt, pride or pity.

Transactional associations, where affective states are linked in retroactive loops with perceived stable expectations of success or failure, are finally included in this theoretical model. One of many applications of this general law is the observed behavior of medical students and that of teachers. Both of these groups are more willing to help students or clients in perceived uncontrollable situations. Causes perceived as controllable by the individual in need give rise to neglect, whereas causes perceived as uncontrollable by that person generate help and empathy from the professional. These reactions can also be observed in smoking cessation, parole decisions, rape or discouragement response to flight delays. On these grounds, theoretical breadth, depth and generalizability appear to be achieved and this attributional theory could even replace Freudian or Hullian psychology in clinical environments.

Weiner leaves some doors open, however. Although he promised at the beginning of the book to explain once and for all the need for affiliation and power motivation, he concludes in Chapter Seven that these two fields are still open for investigation. It may be that these personal needs are not so well explained by the cognitive (rational ?) attribution of causal stability and controllability.

This contribution to attribution theory is magisterial and very worthwhile. One can easily apply it in distance education situations, where persistence or attrition of distance learners is related to expectancy of outcomes and is achievement oriented.

In distance education and in formal adult education, as Houle (1964) and Cross (1981) have shown, decisions to enroll and to persist are closely tied with career-oriented choices. Stable outcomes are expected and motivation for achievement is high. Formative evaluation coupled with summative evaluation serve as feedback mechanisms which nourish positive self-appreciation and diminish fear of failure. If autonomous or internal students tend to look for personal success as reinforcers, external or affiliative students look for approval from influential persons in order to assess their own skills and enhance their achievement motivation. Rewards and recognition offered by stable institutions through their tutors or teachers are greatly valued by students who look for a change in their life expectations, in a stable perspective.

Moreover, a change from externality to internality, or from social dependence to personal autonomy is also possible. In Weiner's terms, the gradual process would be based on a shift from inconsistencies between expectancies and outcomes which generate attributions to unstable causes, such as luck and effort, to a more consistent motivational situation in which high expectancy of success followed by actual success results in attributions to stable factors such as aptitudes and traits.

One can see how a continuity from Lewin, Skinner and Atkinson to Weiner is developing. A positive behaviorism based on beliefs in success-oriented

performances and in stable expectations is once more ascertained. This is a departure from the Freudian deterministic approach and Weiner often repeats that it is a definitive one.

REVIEWER

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Mass Communication in Canada, by R. Lorimer and J. McNulty, Mclelland & Stewart, 1987.

Reviewed by Denis Hlynka

A context for educational technologists. Whether a textbook on the mass media is relevant to educational technologists depends initially on how one defines both mass media and educational media. While such a question is *not* a concern of the text under review here, it is nevertheless an important prior question for educational technologists. Indeed, from Chapter Two of Mass *Communication in Canada,* we are presented with a useful definition of mass media, which the authors derive from British theorist Denis McQual. According to this definition, the mass media are "1) a distinct set of activities. . .2) involving particular technological configurations. . .3) associated with formally constituted instituions.. .4) acting according to certain laws, rules and understandings.. .5) carried out by persons occupying certain roles.. .6) which together convey information, entertainment, images, and symbols.. .7) to the mass audience."

While the above is not exactly a definition to carry around for light conversation, it will do to begin this analysis. For educators, the last two components of the above definition appear to be especially problematic. If the definition requires that the medium — mass or educational — carry *both* information and entertainment, then educational media falls short. It does not normally carry an entertainment function, although one might argue that education can be "entertaining" rather than "boring." However, for our purposes, let us assume that it is sufficient that educational media carry *either* information or entertainment, but not necessarily both.

The next and more significant definitional stumbling block is "... to a mass audience . . . " Is the educational audience a "mass audience?" Again, it depends. Lorimer and McNulty suggest (p. 62) that a mass audience implies large numbers. The authors identify further defining characteristics: the mass audience must be widely dispersed, lacking self-identity, and heterogeneous in terms of being drawn from all strata and demographic groups. Are educational media mass media? No, if one assumes that they are used in small coherent groups for specific teaching purposes to a homogeneous relatively small audience. Yes, if one assumes that educational media are available to all strata, all individuals, and if over time the members are unknown to each other and widely dispersed.

To summarize, educational media may or may not fit under the rubric of mass media, depending upon one's defining characteristics of these two concepts. Nevertheless, the text by Lorimer and McNulty is a valuable reference for educational technologists for two reasons. First, it sets out a solid analysis of a field which, at the very least parallels and impinges upon the field in which educational technologists work. And second, it provides a Canadian context to media.

The text. The book is written in typical textbook style. Each chapter

contains an introduction, a content presentation, lavish use of headings and subheadings, cueing devices such as bold facing for key terms and concepts, a summary, references, and study questions. There is an index, but no glossary. A glossary would have been useful, and is a disappointing omission. Likewise, the study questions are of minimal value, since the authors have provided no answers. While admittedly some of the questions are value oriented, nevertheless, the authors might do well to examine the format of the Open University course books which provide responses or at least guidelines to appropriate responses. Research on text construction shows quite explicitly that unasnswered questions are of minimal value, other than as orienting devices.

Finally, the text has a good scattering of tables and visuals, marred again by the fact that these are not referenced in any way.

The content. Chapter 1 introduces the topic and suggests the range of communication in terms of social, political, economic, educational, cultural, technological, familial, and individual dimensions. The traditional historical division of oral, modern oral, literate, and electronic societies is explored, and specific Canadian issues are identified.

Chapter 2 defines mass communication and examines the author's definition in some detail.

Chapter 3 deals with the mass media and government; Chapter 4 with the design of information; Chapter 5 with the audience of the mass media. The fourth chapter deserves to be singled out as a useful, albeit brief, introduction to semiotics as a potential major tool to study mass communication. Semiotics methodologies are contrasted with content analysis. The fifth chapter, dealing with the audience, continues with a semiotics-like analysis, combined with Marxist analysis techniques.

Chapters 6 and 7 deal with media ownership and the functions of media personnel. Chapter 8 provides a useful survey of Canadian communications policy.

Chapter 9 shifts directions in order to focus on international perspectives and the global geopolitics of information, while its twin chapter, Chapter 10, focuses on domestic aspects of the same issues. A difficulty in writing texts is brought to bear here, in relation to the title concept "geopolitics," within an international and domestic context. Readers might pause for a moment to try to define "geopolitics" in some satisfactory way for themselves. Unfortunately, the reader *must* define this title concept for themselves, since "geopolitics" does not appear in the index, there is no glossary (as has already been noted), and the term is not defined within either of the geopolitical chapters in any explicit way! Incidentally, for those who wish to compare their answers with a correct answer, Webster's New Collegiate Dictionary defines geopolitics as "a study of the influence of factors such as geography, economics, and demography" on the politics and especially the foreign policies of a state." Very nice, but the point is, that such terms need to be handled carefully by textbook authors, and not glossed over quickly.

Chapter 11 covers "New communications technologies in a Canadian context," while the final chapter is titled "Canada in an information age."

Concluding thoughts. The book is a valuable reference for Canadian educational technolgists. It is *not* our field, but is one which is close enough to our interests and activities. As has been indicated above, the text could do with a glossary, answers to the "study questions" and a listing of figures and diagrams within the table of contents. In addition, the historical aspect is played down and might have been a useful inclusion in a comprehensive coverage to Canadian mass communication.

The authors conclude with a comment that "information and its manipulation are changing our world, and far from being a victim of such a change, Canada is one of the few nations of the world in a position to guide and design these changes" That opportunity belongs to Canadian educational technologists as well.

REVIEWER

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Most manuscripts dealing with a topic in general should include reference to supportive literature, while manuscripts submitted to the Profile category may or may not. The Editor reserves the right to change the designation of a manuscript or to make a designation, if none has been made previously by the author. Authors interested in determining the suitability of materials should consult past issues of *CJEC* or contact the Editor.

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Manuscript Preparation

Manuscripts should be typed on 8 1/2x11-inch ordinary white paper. All materials must be double-spaced, including quotations and references. Include a title page on which appears the title of the manuscript, the full name of the author(s) along with position and institutional affiliation, mailing address and telephone number of the contact author. An abstract of 75-150 words should be placed on a separate sheet following the title page. While the title should appear at the top of the first manuscript page, no reference to the author(s) should appear there or any other place In the manuscript. Elements of style, including headings, tables, figures and references should be prepared according to the *Publication Manual of the American Psychological Association, 3rd Edition.* 1983. Figures *must* be camera-ready.

Submission of Manuscripts

Send fourcopies of the manuscript to the Editor along with a letter stating that the manuscript Is original material that has not been published and is not currently being considered for publication elsewhere. If the manuscript contains copyright materials, the author should note this in the cover letter and indicate when letters of permission will be forwarded to the Editor. Manuscripts and editorial correspondence should be sent to: Robert M. Bernard, *Canadian Journal of Educational Communication.* Education Department, Concordia University, 1455 de Maisonneuve Blvd. W., Montreal, PQ, H3G 1M8.