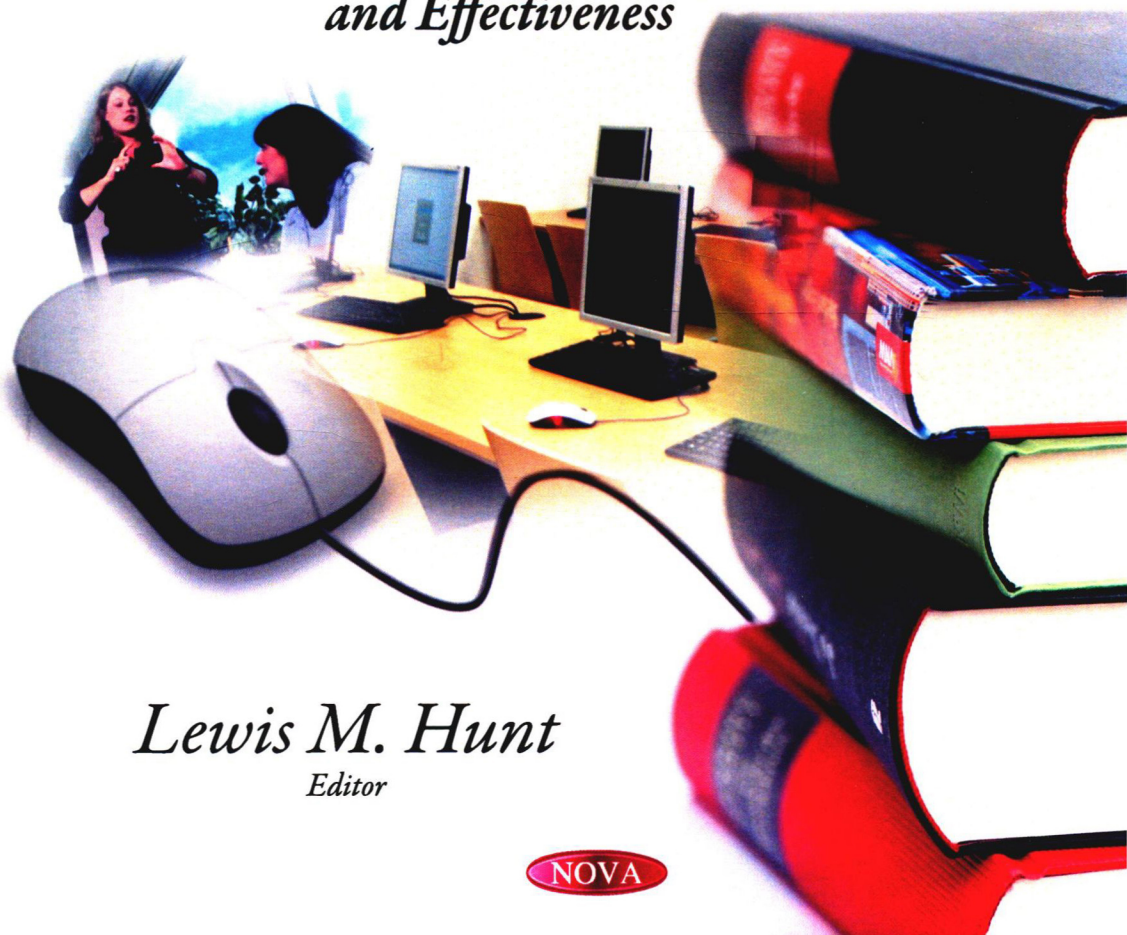


EDUCATION IN A COMPETITIVE AND GLOBALIZING WORLD

Interactive Learning

*Strategies, Technologies
and Effectiveness*



Lewis M. Hunt
Editor

NOVA

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Contributors

Richard G. Guy
G. L. Piangiamore
G. Musacchio
M. Devecchi
Carrie L. Griffiths

Jacqueline L. Olin
Dina Di Giacomo
Nicoletta Caputi
Pierpaolo Vittorini
Yih-Ruey Juang



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Effective Learning: Strategies, Techniques and

EDUCATION IN A COMPETITIVE AND GLOBALIZING WORLD

**INTERACTIVE LEARNING
STRATEGIES, TECHNOLOGIES
AND EFFECTIVENESS**

LEWIS M. HUNT
常州大学图书馆
EDITOR
藏书章

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PREFACE

Active learning is a model of educational instruction that allows learners to be responsible for developing problem solving skills. Technology can enhance active learning strategies by fully engaging students in the learning process. While this type of active learning allows learners to work at their own pace in order to understand the material presented, they can also apply it to the activity at hand to assess their baseline understanding. Most of what the authors need to know about interactivity in an e-learning environment can be derived from careful consideration of how a student and a teacher interact in a face-face setting. The first chapter presents a review of interactivity in the online medium with a focus on the student point of view. Chapter two presents situated learning episodes with a focus on natural hazards that may strongly affect lives of many people around the world while being highly underestimated by formal education. Chapter three describes the development and implementation of simulation software activities to facilitate learning in a doctor of pharmacy program critical care pharmacotherapy elective course. Chapter four examines technology and learning processing in childhood. The final chapter proposes a learning strategy—peer assessment by questions and answers—to enhance the effectiveness of interactive learning in the flipped classroom.

Chapter 1 - This chapter presents a review of interactivity in the online medium with a focus on the student point of view. However, the scope of the material presented is limited to student-teacher or student-e-learning system interactions, and personal or collaborative interactions mediated by online systems are not considered here. Inadequate application of what is already known about learning in general to e-learning may result in unsatisfactory outcomes, so it is important to consider how individual students learn in more

traditional environments and then apply these findings. So what do the authors know? It is clear that students need to be motivated to meet (or exceed) specified learning outcomes, and to achieve the latter, they must apply appropriate learning strategies. In addition, self-efficacy or belief in the ability to meet learning goals is also important. In the same way that a teacher would interact with a student, any e-learning system should provide motivational support, establish and (if necessary) extend the range of learning approaches available and ensure that the motivation/strategic combination will lead to confidence in interacting with the learning material being studied. A common question asked by students is “what depth of learning do I require?” and so the system should be able to specify not only exactly what the student is expected to learn but also to assess whether or not the student is learning appropriately. To these ends, system-generated feedback should highlight any difficulties that a student might have with understanding any particular area. In a traditional learning environment, students usually interact with a teacher who establishes what learning approaches are being used, what the students’ relevant prior knowledge is and whether there are any misconceptions to be resolved. Obviously an e-learning system should attempt to duplicate such student/teacher interactions in order to tailor the learning experience to each individual student e.g., reduce cognitive load by simplification of material; focusing on a few significant items, providing worked examples, using analogies or perhaps using visual approaches (diagrams, concept maps or flow diagrams). Furthermore e-learning systems must be designed to provide optimum interactivity by simplifying the interface, presenting content in “student-friendly” ways and adapting to individual needs.

Chapter 2 - In many countries worldwide, living in a natural hazard prone land does not seem to be a prerequisite that drives governments and citizens to take actions on promoting knowledge and safety. This is a disappointing issue and poses important challenges to school education. School should be the major environment forming a more resilient future society and the place where to implant ideas able to make the difference from the past, where the authors might have the chance to find solutions for the sustainability and security of future generations. Episodes of Situated Learning (ESL) have the potential to actively engage today’s students and therefore can be successfully used to promote knowledge on fundamental issues that affect future generations. As such, the method is based on active learning strategies and relate to the three learning domains referred to as knowledge, skills, and attitudes. They are based on a flipped-up approach to learning that starts from research on a certain subject, acts on problem solving abilities, encourages a classroom

discussion engaging students in solving problems in a learning-by-doing framework, and ends with a reflective learning approach, where concepts are reworked and restructured. Research is done through digital media, which is more suitable to students.

In this chapter the authors will use the acronymous EAS (Episodi di Apprendimento Situato) instead of the english translation ESL, to be more consistant with the literature. The authors present and discuss EAS experiences focused on natural hazards (earthquakes, tsunamis and floods) that may strongly affect lives of many people around the world while being highly underestimated by formal education. Comics are used to trigger interest of students, engage them in finding the way to get around situations to develop life skills that might end up being fundamental for their own safety. The authors let the young implement their own strategy to communicate *dos and don'ts* on natural hazards and design three experiences: EAS1 - *There's an earthquake! What to do?*, EAS 2 - *Earthquake and tsunami: what should I do if I am outside?*, EAS 3 - *Floods: what to do?*

Schools should take a role of social responsibility in the critical use of natural resources and promote accurate information on natural hazards and has a duty to convey the concept that earthquakes, tsunami, landslides, floods, are natural phenomena that become disasters more often because of reckless land management. And all this can become an interesting research and discovery for students through an EAS.

Chapter 3 - Active learning is a model of educational instruction that allows learners to be responsible for developing problem solving skills. Technology can enhance active learning strategies by fully engaging students in the learning process. While this type of active learning allows learners to work at their own pace in order to understand the material presented, they can also apply it to the activity at hand to assess their baseline understanding.

In the healthcare field, computer-based clinical simulation is a practical method to ensure learners are able to perform decision-making skills. The platform allows learners to practice techniques necessary for patient care in a safe and realistic environment. Simulation activities have become increasingly popular with today's technological advances. Through simulation, learners are able to see the outcome(s) of their decision and other potential decision options resulting with the same final outcome. These decisions can range from simplistic to very complicated and multifactorial depending on the difficulty of the patient scenario presented. This type of technology software allows for either team-based or individual learning cases.

This chapter will describe the development and implementation of simulation software activities to facilitate learning in a doctor of pharmacy program critical care pharmacotherapy elective course.

Chapter 4 - Technology-enhanced learning represents one of the most interesting fields in literature. Nowadays, children learn quickly how to use technology (PC, Smart-TV, smartphone). Therefore, educators and teachers report that children are highly skilled in learning process when it is based on technology.

The authors undertook an original research to compare cognitive performance of children stimulated by board or technological games at home. The research was conducted on an Italian sample of 191 children aged between 7 and 11 years old. The results are interesting: Children exposed to technological stimulation perform cognitive tasks differently than children exposed to board stimulation. Moreover, the study highlighted how technology is useful to enhance learning process and how the integration of technological and traditional tools in the classroom environment promotes learning and increases the scholastic success. Particularly, the synergy between traditional teaching and technology might be considered an additional benefit for learning by modeling children cognitive development and helping them to process tasks more quickly and efficiently.

Chapter 5 - Teachers adopt the flipped classroom model to promote the effectiveness of interactive learning in the classroom. It is key to the success of this model that students prepare for lessons before class. However, most students are not in the habit of previewing materials before class and teachers are unable to gauge the extent of students' preparations. This research proposes a learning strategy — peer assessment by questions and answers—to enhance the effectiveness of interactive learning in the flipped classroom. An online learning system was developed to support the application of the strategy. Practically demonstrating the application of the strategy in a quasi-experiment in a classroom revealed that the strategy positively influenced learning achievement, motivation, and interaction. This article describes the design, development, and verification of the strategy and the supporting system and provides recommendations for future research.

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Chapter 1

INTERACTIVITY AND E-LEARNING: THE STUDENT PERSPECTIVE

Richard G. Guy^{*}

School of Medical Sciences, RMIT University,
Bundoora, Victoria, Australia

ABSTRACT

This chapter presents a review of interactivity in the online medium with a focus on the student point of view. However, the scope of the material presented is limited to student-teacher or student-e-learning system interactions, and personal or collaborative interactions mediated by online systems are not considered here. Inadequate application of what is already known about learning in general to e-learning may result in unsatisfactory outcomes, so it is important to consider how individual students learn in more traditional environments and then apply these findings. So what do we know? It is clear that students need to be motivated to meet (or exceed) specified learning outcomes, and to achieve the latter, they must apply appropriate learning strategies. In addition, self-efficacy or belief in the ability to meet learning goals is also important. In the same way that a teacher would interact with a student, any e-learning system should provide motivational support, establish and (if necessary) extend the range of learning approaches available and ensure that the motivation/strategic combination will lead to confidence

^{*} Corresponding author: P.O. Box 71, Bundoora, Victoria 3083, Australia. e-mail: richard.guy@rmit.edu.

in interacting with the learning material being studied. A common question asked by students is “what depth of learning do I require?” and so the system should be able to specify not only exactly what the student is expected to learn but also to assess whether or not the student is learning appropriately. To these ends, system-generated feedback should highlight any difficulties that a student might have with understanding any particular area. In a traditional learning environment, students usually interact with a teacher who establishes what learning approaches are being used, what the students’ relevant prior knowledge is and whether there are any misconceptions to be resolved. Obviously an e-learning system should attempt to duplicate such student/teacher interactions in order to tailor the learning experience to each individual student e.g., reduce cognitive load by simplification of material; focusing on a few significant items, providing worked examples, using analogies or perhaps using visual approaches (diagrams, concept maps or flow diagrams). Furthermore e-learning systems must be designed to provide optimum interactivity by simplifying the interface, presenting content in “student-friendly” ways and adapting to individual needs.

INTRODUCTION

Most of what we need to know about interactivity in an e-learning environment can be derived from careful consideration of how a student and a teacher interact in a face-face setting. Interactivity, in this context, can be defined as “the reciprocal activity between a learner and a teacher/computer system, in which the response of the learner is dependent upon the teacher/system feedback (and vice versa)” (Domagk et al. 2010). One-on-one tutoring between teacher and student is a highly effective means of promoting learning (Bloom 1984) and human tutors can use their skills to encourage students to improve their learning by “triggering” prior knowledge, specifying sub goals, monitoring performance and encouraging use of effective strategies. Teachers are able to promote learning for students with different learning approaches and abilities and also for students with different backgrounds, including those from diverse socio-economic and cultural backgrounds. As part of this process the teacher can assess critical information about student knowledge, goals, skills, motivation, and interests and then provide specific formative feedback appropriate for that particular student. A teacher may also promote how students use the material they have learnt when they encourage them to make inferences, think critically, construct arguments, make judgments, come to conclusions, make associations and problem solve. The

teacher also has to deal with situations where the student's concerns are not clearly stated and where some degree of interchange must occur before suitable feedback can be provided. In addition the teacher must respond when feedback provided to the student is not understood and where alternative approaches have to be used. Thus the hallmark of teacher-student interaction is a high degree of flexibility to provide useful feedback in a number of different learning contexts. The question then becomes "can an e-learning system match the capabilities of a human tutor?" Is it possible for such a system to interact with a student to the extent that enough appropriate feedback is provided for the student to achieve the sudden jump in understanding ("light bulb" moment) often observed by human teachers? Although teachers may possess a wide range of approaches that may be used to assist students, it is also true to say that they rarely have comprehensive information about student knowledge and cannot be sure that a particular teaching approach will be effective or whether the student is ready to progress to the next topic. This necessitates making decisions about teaching techniques/approaches/forecasting under uncertain conditions. It would therefore be naïve to suggest that all interactions with students result in successful outcomes, for example, as VanLehn et al. (VanLehn et al. 1992) pointed out, *"you have probably been visited by students who are bright, work hard, and yet get low grades on the exams. They want to know what they are doing wrong. If you suggest that they study harder, they ask you, 'how'? Feeling slightly sheepish, you roll out the litany of 'good study habits' ... The students reply, with perhaps some irritation, that they already do that ... They want to know how can they study as effectively as their friends."*

THE ELEMENTS OF LEARNING

Effective learning involves a dynamic interaction between cognition, motivation and metacognition. The term cognition relates to the strategies used during the learning process and the processing of learnt material (Moreno and Mayer 2007). However, to reach a learning goal a student needs motivation, which can be regarded as the "driver" that ensures that the learning process continues until goal achievement. Motivation includes several elements that relate to the student belief that they can deal with the learning material (self-efficacy), the value a student places on the material to be learnt, which is closely allied with interest (task value) and how learning progress compares with specified learning outcomes (goals). On the other hand metacognition

refers to the ability of an individual to reflect and report on a range of mental states (Fleming et al. 2012) including learning strategies and motivation to learn. Metacognition encompasses student determination of strategy type and sequence (planning), receipt, monitoring and evaluation of the learning process (monitoring) and modification of learning approach based on the results of monitoring (control) (Vrugt and Oort 2008). When one considers the “typical” questions a student might ask a teacher (Chin and Brown 2002) it becomes apparent that most involve combinations of motivation, strategy and metacognition. Thus a teacher would have to address these different facets of student questions to provide a satisfactory answer and one should also consider all of these elements of learning in an e-learning system. In the following sections of the chapter motivation, strategy and metacognition are discussed in terms of what we know from student-teacher interactions and to what extent e-learning systems address these elements of learning.

MOTIVATION

A student’s motivation affects the level of engagement with learning materials and the cognitive and metacognitive aspects of learning (Pintrich and E.V. 1990; Pintrich 1999; Pintrich 2003; Schunk 2008; Vrugt and Oort 2008). Motivation can be generated from within (intrinsic motivation) or by external forces (extrinsic motivation) with the former aligned with high levels of metacognition and the latter with students who rely more on following directions. In a one-on-one situation a teacher can gain some idea of a student’s motivation and may be able to elevate this level. In the same way an e-learning system may be able to gather information about an individual’s motivational state (Song and Keller 2001) and use this information adaptively to alter content, mode of content presentation, timing, nature and degree of feedback, system structure and navigational properties. To these ends some e-learning system models have incorporated motivational and emotional components such that a student’s motivational level could be influenced by system adjustments and provision of emotional feedback such as “reward or recognition” as they progressed through study material (Astleitner 2000; Keller 2010). For example if the student satisfied a particular requirement the system could recognize this and provide positive feedback.

Although the previous discussion provides some guidance it is important to consider three important aspects of motivation – goals, task value and self-