

# INTERACTION IN ASYNCHRONOUS WEB-BASED LEARNING ENVIRONMENTS: STRATEGIES SUPPORTED BY EDUCATIONAL RESEARCH

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## ABSTRACT

Because of the perceived advantages and the promotion of Web-based learning environments (WBLEs) by commercial interests as well as educational technologists, knowing how to develop and implement WBLEs will probably not be a choice, but a necessity for most educators and trainers in the future. However, many instructors still don't understand the most effective strategies for designing and implementing effective WBLEs even though numerous studies have demonstrated that the success or failure of online learning depends largely on the quality of interaction within those learning environments. Indeed, it has been said learning is impossible without meaningful cognitive interaction. However, this kind of interaction does not occur by itself. The primary goal of this paper is to explore the importance and characteristics of meaningful interaction in online learning, especially in asynchronous contexts. A secondary goal of this paper is to present several pragmatic strategies for improving meaningful interactions in WBLEs on the basis of a review of relevant research literature.

## KEYWORDS

Asynchronous Online Interaction, Meaningful Interaction, Guiding Strategies, Web-Based Learning Environment

## I. INTRODUCTION

Increasingly, the World Wide Web and other Internet technologies are becoming one of the main delivery systems for effective learning and teaching [1]. From elementary schools to universities, as well as at the corporate level, educators and trainers are using the World Wide Web and other Internet technologies to supplement classroom instruction with information specifically designed for instructional purposes as well as with information found in online resources originally intended for other reasons [2]. A few innovators are even using the Internet to deliver unique learning experiences unavailable through other means [3, 4]. The potential for change and innovation in the instructional delivery approaches is still expanding, and there is no reason to think that the growth of technological innovations will be slowed [4, 5].

Because of its perceived advantages by commercial interests as well as educational technologists, knowing how to develop and implement Web-based learning environments (WBLEs) probably will not be a choice for most educators and trainers in the future, but a necessity. Unfortunately, most instructors lack expertise in developing and facilitating WBLEs, and enhancing the quality of Web-based learning remains an important and necessary challenge.

## II. ASYNCHRONOUS WEB-BASED LEARNING ENVIRONMENTS

One of the most widely used affordances of the Internet in WBLEs is asynchronous learning through means of online discussion forums where students can exchange ideas, discuss issues, and collaboratively search for solutions to problems. Instructional technologists, among others, promote the integration of online discussion forums and similar tools into WBLEs in the belief that students will use them to think and construct their own ideas, to compare their ideas with those of other people, and to reflect upon and reexamine their own understanding by reading and responding to peers' and instructors' postings [6]. Because of these perceived advantages, asynchronous text based technology is one of the most widely used tools across educational institutions around the world to support online learning [7]. Indeed, participating in and contributing to asynchronous discussions has become a required activity for many, if not most, college students today [8, 9].

However, the quality and effectiveness of supporting meaningful learning through Web-based learning and more specifically through asynchronous online discussions are still in doubt [10]. In a study involving 122 undergraduate students in the UK, Davies and Graff [11] found that greater participation in online discussions did not lead to better performance as measured by course grades. A recent review by Tallent-Runnels et al. [7] found that such asynchronous communication facilitated in-depth discussion, but no more than in traditional face-to-face class sessions. Just as instructors often struggle to engage students in classroom discussions, many online instructors find that they must require students to make a certain number of postings per week in online discussion forums, and as a result, students often post comments that have little relationship to higher-order thinking or learning just to meet the required number of postings [8]. Clearly, students who post to web-based discussion forums just to meet course requirements are unlikely to be engaged in meaningful interaction that stimulates learning.

## III. MEANINGFUL INTERACTION

One of the key components of good teaching and learning, online or otherwise, is interaction. It has been argued that success or failure of online learning depends on the level of interaction that occurs [12, 13]. Milheim [14], after reviewing the literature on interaction within online learning, concluded that the consideration of interaction is the most important element in designing online learning. Trentin [15] also maintained that the quality of online learning depends on interaction, and he predicted that a 'third generation' of online technology would afford richer interaction and therefore increase the quality of learning. Beldarrain [16] describes how emerging technology tools, including wikis, blogs, podcasts, and social software applications, are being used to foster student interaction in online learning.

The nature of learning interaction can be defined in a variety of ways, for example, based upon the types of tasks which challenge participants within a course ranging from traditional academic tasks or real world authentic tasks [17, 18]. In addition, interaction is obviously influenced by the relationship between the teacher and the learners and the degree to which a course is teacher-centered or learner-centered [19]. The nature and level of involvement by participants in a specific instructional experience is also dependent on whether the participants are in face-to-face situation or at a distance using online technologies [12].

Within the context of online learning, several of the existing definitions of interaction are derived from communications theories and tend to be somewhat abstract. For example, Wagner [20] defined interaction as “the reciprocal events that require at least two objects and two actions” (p.8). The interactions occur when these two objects and events mutually influence each other. Moore’s [21] definition of interaction is based upon a communication-based framework, defining the sender and receiver of three types of interaction: learner-content, learner-instructor, and learner-learner. Northrup [22] proposed five interaction purposes: to interact with content, to collaborate, to converse, to help monitor and regulate learning (intrapersonal interaction), and to support performance. Even though these definitions have been widely used as a basis of online interaction research, they do not consider the importance of learning which occurs during the interaction. When the interaction directly influences students’ learning, we can say the interaction is meaningful [23, 24].

A more insightful approach to defining interaction in WBLEs may be derived from the learning theories underlying the development of particular learning environments. For example, behaviorists would emphasize the arrangements of stimuli, responses, and reinforcements that underlie interaction whereas social constructivists would seek to maximize the degree to which learning interactions enhance meaning making [25]. Therefore, depending on how learning is defined, the image of meaningful interaction is changed [24]. Recently many educators, including the authors, have come to see the value of social constructivism as a foundation for the design of more effective learning environments. This paper will accordingly follow the social constructivists’ perspective. According to social constructivism as a learning theory, meaning is constructed in communities of practice through social interaction focused on solving shared problems, and thus social constructivists emphasize establishing dialogic interaction within the learning environment to promote student learning [26].

The definition of interaction provided by Vrasidas and McIsaac [27] follows the social constructivists’ perspective. They defined “meaningful interaction” as “the intellectually stimulating exchange of ideas” [27]. Meaningful interaction is not just sharing personal opinions. Instead, the interaction must stimulate the learners’ intellectual curiosity and directly influence their learning. This kind of meaningful interaction is an essential ingredient in any learning process. When students have engaging opportunities to interact with one another and their instructor, regardless of whether they are online or not, they can analyze, synthesize, and evaluate course content and use their new learning to construct shared meaning, solve ill-structured problems, and develop better understanding of their own knowledge [28]. Indeed, it has been said that learning online is impossible without meaningful interaction [29].

#### **IV. THE CHARACTERISTICS OF ASYNCHRONOUS MEANINGFUL INTERACTION**

At this time, asynchronous online courses are primarily dependent on written text as the communication medium. To have meaningful interaction within asynchronous learning environments requires that “others do respond; they argue against points, add to evolving ideas, answer questions, and offer alternative perspectives” [30]. According to studies of online learning, in comparison with oral interaction in a face-to-face classroom setting, asynchronous online written interaction focuses more on the topic, better supports the emergence of multiple perspectives, and encourages deeper reflection [30, 31, 32].

Ideally, through meaningful interaction, learners can advance their learning because of the unique benefits of an asynchronous WBLE such as the possibility of developing a better understanding of different perspectives, an ability to compare progress (and mistakes) with others or with set standards for interaction, opportunities for engaging in deeper reflection, and a richer exploration of the topic using Internet resources [9, 33]. Wilson and Stacey’s [34] analysis of the effects of online interaction on

learning showed that group online interaction and sharing of resources helped students to become engaged in constructing new ideas and understanding other people's perspectives. In the context of asynchronous conferencing, students can negotiate meanings together, and, on the basis of the results of the negotiation, experience individual conceptual changes, a necessary process for effective learning [35].

Although successful, meaningful interaction can provide opportunities for reflection, exposure to multiple perspectives, sharing of ideas, and the discovery of what others are doing to learn [36], most present day Web-based learning environments do not live up to their potential for meaningful interaction [10, 37]. At least some of this failure can be attributed to technological weaknesses that tend to force students to put more of their cognitive load capacity into handling the user interface of a WBLE than into the learning process itself. In general, courses that include online discussions among learners in higher education through the use of commercial course management systems have not proven to be very satisfactory for learners or instructors [10]. Students are often overwhelmed and frustrated by the enormous amount of materials surfacing on the discussion bulletin board during the duration of a course. For example, Kirby [38] found that learners had difficulty tracking on-going discussions, and complained that it took several hours daily to keep up with the bulletin board. Hara and Kling [39] described the frustration students experienced with unfriendly technology and unreliable teachers in an online learning environment.

Once the novelty factor of online discussion abates, many students appear to lose their desire to write regular postings to a course discussion forum [40]. As a result, unless an instructor requires compulsory postings, learners usually fail to post their ideas on a regular basis, lose interest in the discussion, and the bulletin board gradually dies [41]. It won't surprise any experienced instructor that required postings are often shallow in substance [42]. Kanuka and Anderson [36] revealed that most of the interaction in their asynchronous online course was of a straightforward sharing and receiving information without meaningful dialog. When the students experienced information contradiction, there was a tendency to ignore it, and thus students failed to engage in the cognitive processes required to construct new knowledge. Similarly, Pena-Shaff, Martin and Gay [43] found that many of the messages posted on the discussion board looked more like monologues than dialogues, and there were also many postings in which students did not support their ideas with evidence. The so-called online discussion was only an opinion-sharing activity. In such situations, it is difficult to find evidence that meaningful interactions and learning have occurred. Kirschner, Strijbos, Kreijns, and Beers [44] summed up the problems with contemporary WBLEs as follows:

*...these environments do not support such interactions in the same way that it occurs in face-to-face (i.e., time delay, lack of complete sensory contact, non-availability of off-task activities, etc.). The proximate result is often disgruntled or disappointed students and instructors, motivation that is quickly extinguished, poorly used environments, wasted time and money, and showcase environments that are often not much more than computer assisted page turning. The ultimate result is very similar to the first problem—no learning, because the students tend to give up. (pp. 47–48)*

Meaningful interaction does not occur by itself, especially in the context of teaching and learning online. Learners cannot be expected to know how to interact meaningfully in an online situation, even if all of the technological barriers are removed, without guidance. It should be clear that instructors who are striving to develop dynamic online environments and promote meaningful interaction within their online classes face many challenges [45, 46].

## V. HOW TO PROMOTE MEANINGFUL INTERACTION

While it is evident that new technologies have expanded the potential for online interaction between students and instructors, meaningful interaction that actually contributes to student growth and learning requires careful planning on the part of the instructor. Social constructivists, drawing on the work of Vygotsky [47], have suggested that learning environments should involve ‘guided interaction,’ emphasizing the role of the instructor for providing the necessary guidance [48]. Facilitating interaction among students is central to the role of the online-learning instructor [49]. Instructors must provide the pedagogical foundation and structure to guide learners [50].

The level of interaction among online learners is influenced heavily by the structure of the course [27], which in turn is driven by the pedagogical strategies employed by the instructor [51, 52, 53]. According to a report from professors at the University of Illinois regarding teaching on the Internet (see <http://www.vpaa.uillinois.edu/tid/report/>), instructors should carefully organize student interactions, limit their lecturing, address student system familiarity, and intermittently summarize discussions and comments. Especially in asynchronous situations where there are few, if any, visual cues, the online instructor must be actively involved in monitoring and guiding the class to prevent it from being a simplistic opinion-sharing activity that fails to support learning. Regarding the need to guide meaningful interaction, Gallini and Barron [6] said,

*Students need more specific guidelines and structures for interacting in asynchronous and synchronous environments, chat discussion groups, and even e-mail to become engaged in coherent group and meaningful interactions. (p.152)*

In a similar vein, Johnson and Aragon [9] wrote,

*Two things are important to keep in mind. First, although the quantity of interactions is important, the quality of interaction is what should be stressed. Second, it is important that the instructor model the expected type of interaction by providing quality comments to the discussion itself. (p.40)*

Thus, one of instructors’ more important tasks is to assist with strategies that facilitate meaningful use of the online educational environment for learning. Asynchronous online learning enriched with instructor guidance can help students increase their learning by guiding them to engage in a process of critical and reflective thinking, but this requires the design and use of effective facilitation strategies [31]. Research demonstrates clearly that instructors need to develop and apply better strategies that can foster meaningful interactions for learning on the WBLEs [9, 54, 55, 56].

### A. Studies on Interaction Strategies in WBLEs

Although there is insufficient research that provides guiding strategies in online learning environments, some researchers have tried providing useful guidelines. Table 1 outlines the efforts.

Researchers	Research Supported Strategies
Bannan-Ritland, Bragg, and Collins [51]	Encouraging reflection Making a community of practitioners Applying project-based learning
Levin and Waugh [57]	Question answering and question asking

	Collaborating
	Student publishing
	Web weaving
	Project generating and coordinating
Lourdusamy, Khine, and Sipusic [58]	Using authentic cases
McIsaac, Blocher, Mahes, and Vrasidas [59]	Providing immediate feedback
	Encouraging the discussion
	Assigning pairs for moderating online discussion
	Using collaborative learning strategies (group project, group debate)
Northrup [22, 60]	Using innovative strategies including case studies, debates, role plays, and gaming.
	Requiring timely responses from peers and from instructor
	Providing an opportunity to self-monitor learners' own progress
Rossman [61]	Posting a weekly summary of the online discussion
	Monitoring the quality and regularity of learner postings
Vrasidas and McIsaac [27]	Training students to use emoticons, to use the conferencing system, and to employ appropriate etiquette
	Assigning student pairs with a mixed range of skills

**Table 1. Research Related to Guiding Strategies**

Through an in-depth literature review study, Bannan-Ritland et al., [51] provided a framework that integrates educational constructs (e.g., reflective components, social components and content components) with learning principles and instructional activities to identify effective instructional strategies for Web-based courses. They suggested following similar strategies in each educational construct:

- providing individual and small group reflection opportunities;
- asking for periodic self-evaluation to support reflective components;
- using a project based learning approach to content components;
- organizing social components such as a lounge or café to encourage a community of practitioners;  
and
- providing a clear and direct syllabus that permits assignment alternatives students can choose and ensures a match between objectives, strategies and assessment.

Levin and Waugh [57] investigated “teleapprenticeships” as interaction frameworks that support learning in the online context. Through a case comparison technique, five kinds of teaching apprenticeships were studied: question answering and asking, collaboration, student publishing, web-weaving, and project generation and coordination. They concluded that the integration of these apprenticeship frameworks into supportive institutional structures with new mediator roles is important for successful online learning.

Lourdusamy, Khine, and Sipusic [58] explored the impact of a tool that allows users to engage in collaborative discussion based on viewing authentic video footage (e.g., classroom teaching episodes) in teacher education. By rating students’ participation and the quality of their comments, the authors

concluded that using authentic cases increases the quality and quantity of interaction in online learning situations. In addition, writing comments on authentic cases encouraged students to think and to see the relationship between theory and practice more clearly.

McIsaac, Blocher, Mahes, and Vrasidas [59] explored the perceived advantages and disadvantages of various types of interaction in an online classroom by analyzing several kinds of statistical data, message archives, and participant interviews. The feeling of isolation and the lack of immediate feedback were identified as main disadvantages. Based on the results, they concluded that instructors should contact students frequently and individually, show up online often to actively participate in the discussions, and use collaborative learning strategies in order to improve online interaction.

Northrup [22, 60] investigated several types of interactions that students perceived to be important for online learning through the administration of the Online Learning Interaction Inventory. The instrument focused on the four interaction attributes of content interaction, conversation and collaboration, intrapersonal/metacognitive skills, and need for support. As a result, the need for timely responses from peers and instructor, and the need for students to self-monitor their progress were identified as the most important factors in online learning. In addition, she found that students wanted to use some innovative strategies including case studies, debates, role-play, and playing games.

After analyzing the evaluation documents from 154 asynchronous online courses, Rossman [61] presented several tips for successful teaching in an online environment using an asynchronous discussion forum. Among them, providing specific and prompt feedback, modeling discussion processes, and providing specific course guidelines were representative.

Using an interpretivist approach, Vrasidas and McIsaac [27] examined the nature of interaction in an online course from both teacher and student perspectives to identify the factors influencing interaction. Data were collected through interviews, observations, and a review of online messages. As a result, four major factors influencing interaction were identified: structure, class size, feedback, and prior experience. Based on the research experience, the authors suggested requiring students to engage in discussion and collaborate on projects; training students early in the course to use emoticons, the conferencing system, and appropriate etiquette; and assigning students to collaborative pairs with a mixed range of skills.

## **B. Representative Strategies**

On the basis of the review of the preceding studies, five representative strategies to increase the meaningful interaction in WBLEs were identified. They are modeling, dividing the class into small groups, giving appropriate feedback, encouraging reflection, and using authentic activities.

### **1. Modeling**

First of all, instructors can model effective online interactions by demonstrating initiative, moderating discussions, and providing good examples of prior students' work. It is important to provide explicit guidelines about the level of participation expected in online contributions and then to exemplify this level in the instructor's interactions [62]. In particular, in an asynchronous situation, the instructor should model how to contribute to an online discussion, how to respond to other people's postings, and how to use emoticons and netiquette appropriately. An instructor can actively participate in the discussion, show higher-order thinking in postings, and acknowledge or constructively critique remarks that other students have posted. Instructors also may choose to provide prior student contributions as a means of modeling expectations, lowering student anxiety and increasing other students' self-efficacy [27, 63]. In this way,

instructors and peers serve as models for increasing participation and contribution within a new educational context [9].

Instructors can also model how to humanize the online learning environment [27, 63]. That is, they should play a key role in setting the emotional tone for their asynchronous online interactions [56]. Emotional tone can be shown through the use of emoticons made by combinations of punctuation marks [64]. Used appropriately, emoticons make it possible to express learners' attitudes toward the topic being communicated and to describe vivid and dynamic feelings [65, 66]. Most emoticons are composed of keyboard symbols. Some are simple and others are complex. The University of Illinois has provided a collection of emoticons to help their online learners (see <http://www.ion.uillinois.edu/resources/tutorials/communication/index.asp>). Figure 1 below illustrates some of the common emoticons used in online discussions.

Emoticon	Meaning	Emoticon	Meaning
:@ or :-@	Angry or screaming	>:-(	Angry, annoyed
-I	Asleep	:/	Somewhat unhappy/discontent
:	Serious	:o or :-o	Bored
:V	Big mouth	:'( or :-')	Crying/sad
:D or :-D	Grinning	{ }	Hug
:*) or :-*)	Kiss	:-D	Laughing
:X or :-X	Mute	:l or :-l	Not talking
:< or :-<	Sad	:> or :->	Sarcastic
B) or B-)	Shades	=;) or =:-)	Shocked
:Z or :-Z	Sleeping	:) or :-)	Smiling
:O or :-O	Surprised	:() or :-()	Talking

Figure 1. Common Emoticons Used in Online Discussions (by The University of Illinois)

After modeling, the instructor can scaffold the interaction by providing guidance and supporting materials [67]. Admitting and supporting the naturally occurring role of “lurker,” i.e., someone who reads the messages of an interaction but does not contribute in online interactions [68], is a challenge not to be ignored. Novice learners can observe netiquette and ways of particular interaction by lurking [57]. In this way, the shy or “laid back” learners can vicariously experience meaningful interaction [67], and hopefully, later engage in these kinds of interactions themselves.

## 2. Dividing Class into Small Groups

Building collaborative components into an asynchronous online learning environment can foster interaction [49, 59]. Through a literature review, Tu and Corry [50] concluded “studies have shown that small-group instruction positively impacts student achievement, persistence, attitude, modeling, cognitive disequilibrium, cognitive development and social skills” (p.53).

Small groups with regular online interaction can increase the effectiveness of online learning [57, 59, 69]. To achieve these benefits of small groups, instructors' careful planning and oversight are required. The literature provides several suggestions: try to limit a group size to no more than 15 students with eight to ten being best [70]; set up student to student interaction through introductory activities and biographical posts [35, 56, 64, 71]; provide an ‘ice-breaker’ to introduce the students to each other and to the tutor, in

order to get the ball rolling and to humanize the process [14]; assign students to groups and assign roles for discussions [71, 72]; encourage commenting on each other's writing [72]; require each student or group to be a tutor or guru for a particular concept area [71]; and respect and highlight individual group members' abilities and contributions [50]. However it is accomplished, engaging small teams in online discussions enriches learning interaction and enhances the likelihood that individuals will be responsible contributors [50].

### **3. Giving Appropriate Feedback**

Until students receive a reply or response on what they posted to an online discussion, they typically experience discomfort followed by frustration. Teacher and peer feedback are necessary for encouraging meaningful interaction [9, 22, 59, 60, 61]. An important job of the instructor is to interact with the learners to help bridge the gaps between the learners' understanding and the content. The instructor should also provide appropriate feedback concerning social interactions [48]. The social comments of the instructor and students often motivate other students to participate in online discussions and promote interest in each other's posting [63].

In WBLEs, giving appropriate feedback and providing positive affirmation of student work are essential components of interaction [56, 73]. Although it can be a daunting task with large numbers of students, online instructors can monitor student progress by reviewing chat room transcripts, emails, threaded discussions, and presentation spaces. Based on these reviews, instructors will have a better basis for providing feedback that will help learners engage in interactions that are more than superficial. Allan [74] describes an innovative approach for providing instructors with visualizations of instances of meaning construction and knowledge advancement within online discussion forums. Such a visual approach is especially important in situations where the number of students in a online discussion group is larger than recommended [70].

### **4. Encouraging Reflection**

Vygotsky proposed two levels of interaction. One is on the interpersonal level between individuals, and the other is on the intrapersonal level within the individual [47]. Intrapersonal interaction means reflection. Reflection is "the learner's cognitive activity of looking back at relevant social interactions and their own or group learning activities and also looking forward in hopes of shaping and improving future learning interactions and activities" [48]. The instructor can encourage such reflection by asking students to keep a journal of what they do and experience, draw a concept map of their understanding of a process or idea, or maintain a database related to their new knowledge [22, 51, 60, 75]. Through the journaling process, learners can reflect on their participation in the interaction process. Of course, instructors should provide several good journal examples and demonstrate how to write a reflective journal.

Concept maps and database tools may also be helpful in supporting reflection. Drawing concept maps allows students to show the structure and interrelationships of the learning interactions. Building a database can serve a similar function. Other researchers have suggested their own strategies for encouraging reflection such as providing pause time between major interactions for recapping what has gone before, the use of debates, role-plays, online diaries, one-minute papers and modeling of reflective thinking [9, 76]. In addition, Johnson and Argon [9] recommended that posting an agenda of "the upcoming week serves as an advanced organizer and allows students to come to class better prepared for interaction" (p. 39). Through these pedagogical strategies, learners are able to reflect better and more actively participate in the online interaction process.

## 5. Using Authentic Activities

Perhaps the most powerful instructional strategy involves using case studies or critical incidents that engage students in applying learning to real world situations as discussion or project topics [22, 51, 60]. What people perceive, think, and do develops in a fundamentally social context regardless of whether it is the real world or a virtual one. Brown, Collins, and Duguid [77] stated that knowledge and skills cannot be separated from the context and community where they are used and that gaining knowledge always involves practical activity. Therefore learners should be engaged in authentic activities whenever feasible [18, 78, 79]. Lebow [80] describes authentic activity as “experiences of personal relevance that permit learners to practice skills in environments similar to those in which the skills will be used” (p. 9). Brown et al. [77] describe authentic activities as “ordinary practices of the culture” (p. 34), and Newmann and Wehlage [81] describe authentic activities as real world tasks that a person can expect to encounter in everyday life. Studies have shown that the structure of authentic activities in WBLEs can increase the quality of online interaction [9, 18, 58, 79]. Because authentic activities mirror real world tasks, they require students to cooperate, to communicate, to respect each other’s views, and to use diverse skills to complete the task successfully [82]. Herrington and Oliver [17] describe a framework for designing authentic learning tasks for interactive learning environments.

Through the process of accomplishing authentic activities, meaningful interaction defined as exchanging intellectual ideas with one another is a necessity. In other words, collaborating students in an online learning environment would simply be unable to complete authentic tasks without meaningful interaction just as teams of people working in the real world are unable to complete authentic activities without substantive interaction. Research in Australia and elsewhere indicates the value of engaging in these authentic activities in Web-based learning environments. Herrington and Oliver [17], the foremost researchers in this area of study, concluded that “collaboration and problem solving in the authentic activities or projects provides interactivity in a far more authentic and context-specific manner than is possible with predetermined responses and feedback” (p.43). Table 2 below summarizes the guiding strategies and specific techniques mentioned above.

Guiding Strategies	Techniques
Modeling	Demonstrating initiative Providing good examples of prior students’ work Providing explicit guidelines about the level of participation expected Showing how to respond to other people’s posting Showing how to use emoticons and netiquette Admitting and supporting the role of lurker
Dividing class into small groups	Including introductory activities and biographical posts Assigning roles for discussion Requiring each student or group to be a tutor or guru for a particular concept area Posting upcoming agenda as an advanced organizer
Giving appropriate feedback	Monitoring students progress by reviewing threaded discussion and chat room Providing positive affirmation of student work Providing social comments
Encouraging reflection	Asking students to keep a journal

	Encouraging to draw a concept map
	Providing pause time between major interaction for recap
Using authentic activities	Designing and managing a course following guidelines for authentic activities

**Table 2. Guiding Strategies and Specific Techniques**

## VI. DISCUSSION

Even though, as detailed above, the literature has provided a number of idealized instructional strategies for enhancing online interaction, they are not sufficient for college instructors or instructional designers in real practice. Instructors and instructional designers cannot be expected to know how to apply the idealized strategies to their own online courses without considerable support. Instructors may also have reservations as to whether the above strategies are truly effective in practice. Instructors and instructional designers need clearer guidelines, practical examples, and especially field-related information from other instructors regarding the use of these strategies [83]. By reviewing the successes and failures found in real cases, instructors are able to get a clearer picture of what meaningful interaction is and how meaningful interaction may be supported in online courses. Important questions must be addressed:

- How can those strategies be designed and implemented in real online classes?
- How can learners be motivated to interact with one another in a reflective, engaged manner?
- How can instructors support meaningful interaction through feasible strategies that won't unrealistically increase their workload?
- What kinds of interaction are most meaningful for students' learning online in different fields of study, e.g., medical education or teacher preparation?

Many online instructors seek answers to these kinds of questions. Accordingly, more and better research that reveals the design strategies underlying successful asynchronous online learning cases and analyzes the reasons for the effectiveness of the strategies is needed.

As noted above, when interaction strategies are used appropriately, meaningful interaction can be increased. However, there is another issue to consider. How will we know when meaningful interaction has occurred? In another words, how can we really know whether interaction has affected learning, especially in Web-based learning environments? Woo and Reeves emphasized how interaction processes need to be analyzed and understood in terms of learning. They also introduced several analysis models based on content analysis and discourse analysis techniques [24]. In addition, other models such as the Quality Matters rubric (<http://www.qualitymatters.org>) can be used to evaluate the overall quality of online interaction and learning. However, even though these resources are good starting efforts to analyze and understand online interaction in terms of learning, they can be difficult for practitioners to apply in their own online courses. Instructors and instructional designers still need to find better methods or models to support and evaluate students' interaction and interaction strategies, especially in terms of meaningful interaction in day-to-day online classroom situations. Therefore, more research to develop a practical analysis model is needed. In this regard, "design research" methods are especially appropriate because of their twin purposes of solving real-world problems and identifying reusable design principles and enhanced theory [84]. It is also necessary to investigate the learners' and instructors' perceptions of interaction, interaction strategies, and analysis models in asynchronous web-based learning, and, on the basis of their perceptions, to develop more effective strategies for designing meaningful interaction activities in Web-based learning environments. By applying such research results, instructors and instructional designers may begin to have a clearer picture of successful online interaction and WBLEs

can be designed, implemented, evaluated, and redesigned for increased effectiveness.

## VII. CONCLUSION

Although the World Wide Web and other Internet technologies are becoming so commonplace that participating in and contributing to asynchronous web-based learning have become required activities for many students, there is considerable room for improvement in the design and utilization of these interactive learning environments [1]. Despite its strong potential, many academics remain unconvinced of the effectiveness of asynchronous online learning. Therefore, increasing the quality of asynchronous Web-based learning remains an important and unmet challenge. One of the key components of good teaching and learning is interaction. Indeed, it can be argued that the success or failure of online learning depends on the level and quality of interaction. However, meaningful interaction that actually contributes to student growth and learning does not occur by itself. It requires careful planning on the part of the instructor and the implementation of multiple strategies for improving the interaction.

This paper has presented pragmatic strategies for improving meaningful interaction in WBLEs on the basis of a review of published research. Such strategies include modeling and scaffolding, dividing the class into small groups, giving appropriate feedback, encouraging intrapersonal interaction, and using authentic activities. However, for successful web-based interaction, further research is needed to show successful asynchronous online learning cases, to investigate the learners' and instructors' perceptions of interaction in web-based learning, and to develop more effective strategies for designing meaningful interaction activities in web-based learning environments.

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