Running header: SUPPORT OF THE IAM

IN SUPPORT OF THE INTERACTION ANALYSIS MODEL (IAM) FOR EVALUATING DISCOURSE IN A VIRTUAL LEARNING COMMUNITY

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ABSTRACT

Instructional designers need to be able to assess the level of knowledge construction generated by participants of a virtual learning community (VLC). Such participants include the learners engaged in threaded discussions within online courses. Assessing the level of knowledge construction enables course revisions that scaffold such knowledge construction within courseroom discourse, envisioned as a VLC, in order to increase the quantity or quality of the knowledge construction occurring between participants. Content analysis is an established method used to assess the level of knowledge construction demonstrated in the transcripts of threaded discussions. Yet, researchers have called for the continued use and validation of existing, suitable instruments within content analysis rather than developing researchers developing new instruments that lack extensive use and subsequent validation. In response to these calls, this paper argues that the Interaction Analysis Model (IAM) is an existing, validated protocol for the content analysis of course room transcripts. The purpose of this paper is to endorse the validity of the IAM through a discussion of its development, use, and inter-rater reliability accumulated from 40 published studies spanning 14 years.

KEYWORDS: interaction, discussion, discourse, transcript, content analysis

IN SUPPORT OF THE INTERACTION ANALYSIS MODEL (IAM) FOR EVALUATING DISCOURSE IN A VIRTUAL LEARNING COMMUNITY

Virtual learning communities (VLCs) are a generic term for a diverse collection of opportunities to share, obtain, and create knowledge. The characteristics of VLCs are as vast as the web space that contains them. One characteristic is the use of threaded discussions, such as the type of discourse that occurs within many online course rooms. In online course rooms that seek to facilitate knowledge construction, the discussion board is the most common space in which this collaborative knowledge construction is demonstrated (Calvani, Fini, Molino, & Ranieri, 2010). Given the prominent role that these discussion areas play, Mäkitalo-Siegl (2009) called the discussion boards the "life blood and center of energy" (p. 55) for the online course. Thus, having effective instruments to measure the quality of discourse within threaded discussions is an important component of evaluating VLCs.

Course design is a factor that affects learning by discussion within the constructivist framework common to VLCs. The continued growth of online course delivery (Allen & Seaman, 2010) presents increasing opportunities to design learning activities that promote quality course room discourse. Instructional designers need to be able to assess the level of knowledge construction generated within a course so that revisions to the course design can be made in order to increase the quantity or quality of the knowledge construction.

Content analysis has been established as an effective method for analyzing computer-mediated communication (Krippendorff & Bock, 2008) and is widely used in the field of computer-supported collaborative learning (Strijbos & Stahl, 2007). In terms of illuminating the learning process, content analysis can be used to better understand how learners present and refine their ideas and collaborate with other learners (Blake & Rapanotti, 2001). Thus, content analysis can be used to assess the level of knowledge construction demonstrated in the transcripts of course room discourse.

As with any instrument of research, the protocol used to assess the level of knowledge construction needs to be valid. Messick (1989) noted that "validity is an integrative, evaluative judgment of the degree to which theoretical rationales and empirical evidence support the adequacy and appropriateness of interpretations and actions based on test scores or other methods of assessment" (p. 13). However, Rourke and Anderson (2004) noted that researchers often fail to provide sufficient information to judge the validity of the content analysis protocols utilized in published studies. They concluded that using existing protocols, rather than creating new ones, added to the accumulating normative data and overall validity of the existing protocol. The popularity of the Interaction Analysis Model (IAM), developed by Gunawardena, Anderson, and Lowe (1997), has resulted in just such an accumulation.

Criteria to establish the validity of a content analysis protocol were established by Rourke and Anderson (2004). The IAM is consistent with these criteria as a form of testing and measurement with a theoretically valid coding protocol supported by measures of inter-rater reliability. This consistency is demonstrated through a discussion of the development, use, and inter-rater reliability accumulated from 40 published studies using the IAM over 14 years.

Development of the IAM

Gunawardena et al. (1997) first reviewed existing interaction analysis models in search of one that would be appropriate to analyze the transcript of a computer conference. The researchers considered several of the models reviewed by Mason (1991). These models included the 'message maps' of Levin, Kim, and Riel (1990) which served as diagrams of conference

conversations. The researchers also reviewed the model of Henri (1992), which evaluated conference content related to the social and interactive dimensions and cognitive and metacognitive skills. The model of Garrison (1992) was examined, too, as this tool measured critical thinking in both face-to-face and computer-supported group learning. The researchers also considered the work of Newman, Webb, and Cochrane (1995), who suggested that the five stages of Garrison's critical thinking related to the cognitive skills dimension of Henri's model. Upon testing these models to the transcripts of the computer conference, Gunawardena et al. concluded that the models were insufficient because they focused on a teacher-centered instructional paradigm, failed to distinguish between cognitive and metacognitive dimensions, or interpreted interaction as "mechanistic and descriptive" (p. 407). In a later publication (Gunawardena, Lowe, & Anderson, 1998), the researchers suggested that settling for the previously identified measures "is to overlook the unparalleled opportunity to observe knowledge construction in progress offered by transcript analysis" (p. 2).

Upon identifying the shortcomings of the existing interaction analysis models, Gunwardena et al. (1997) proceeded to use a grounded theory approach to develop their own model, the IAM, which is the instrument used in the proposed study. The researchers analyzed the transcript looking for four elements: types of cognitive activity performed, types of arguments advanced, resources used to explore and negotiate new meanings, and evidence of changes in personal knowledge constructions. These four elements were used to outline the process of negotiation representative of the social construction of knowledge. This process includes the five phases of sharing/comparing, dissonance, negotiation/co-construction, testing tentative constructions, and statement/application of newly-constructed knowledge. Each of the five phases within this model has three, four, or five indicators. The model is illustrated in Table I.

Table I.

Categories and indicators of the Interaction Analysis Model (Gunawardena et al., 1997)

Phase	Category	Indicators
1	Sharing & Comparing	• Statement of observation or opinion • Statement of agreement • Corroborating examples • Asking and answering questions to clarify details of statements • Definition, description, or identification of a problem
2	Dissonance	• Identifying and stating areas of disagreement • Asking and answering questions to clarify the source and extent of disagreement • Restating the participant's position, and possibly advancing arguments or considerations in its support by references to the participant's experience, literature, formal data collected or proposal of relevant metaphor or analogy to illustrate point of view
3	Negotiation & Co-Construction	• Negotiation or clarification of the meaning of terms • Negotiation of the relative weight to be assigned to arguments • Identification of areas of agreement or overlap among conflicting concepts • Proposal and negotiation of new statements embodying compromise, co-construction • Proposals integrating or accommodating metaphors or analogies
4	Testing Tentative Constructions	• Testing the proposed synthesis against 'received fact' as shared by the participants and/or their culture • Testing against existing cognitive schema • Testing against personal experience • Testing against formal data collected • Testing against contradictory testimony in the literature
5	Statement & Application of Newly Constructed Knowledge	• Summarization of agreement(s) • Applications of new knowledge • Metacognitive statements by the participants illustrating their (cognitive schema) has changed as a result of the interaction

After developing the IAM using the principles of grounded theory, Gunawardena, et al. (1997) applied the IAM to the debate transcript. The unit of analysis was determined to be a participant's entire, single message because the message "embodied a participant's cognitive activity and contribution to the construction of knowledge" (p. 416). All five phases of the model were identified within the conference transcript, supporting the efficacy of the model for interaction analysis within constructivist environments.

Use of the IAM

The IAM has been used more than any other model in the published literature. Studies were identified through searches in the following databases, the number of results of which are reported in parentheses and include duplication: Sage-Educational Collection (3), ProQuest-Education (54), Academic Search Premiere (69), ABI/Inform Global (3), ProQuest-Psychology (10), PsyArticles (0), SAGE-Psychology (3), Science Direct College Edition-Social & Behavioral Sciences (80). Studies using the IAM are described according to the year in which they were published.

1997-1998. The application of the IAM to other transcripts began the same year in which the model was published. When applied to a subsequent computer conference (Anderson & Kanuka, 1997; Kanuka & Anderson, 1998), the IAM demonstrated similar utility. Consistent with additional evidence from surveys and telephone interviews, the researchers concluded that "the coding accurately reflects the interaction and knowledge construction that occurred in this forum" (Discussion, *para*. 2).

1999. McLoughlin and Luca (1999) used the IAM to study interaction in a collegiate course on project management for multimedia development. The researchers noted that 66% of the analyzed messages fell within the first phase of the IAM. McLoughlin and Luca concluded that the IAM was a "practical assessment tool" (Abstract, *para*. 2) and indicated their intent to continue using the tool for future analyses.

2000-2001. No published studies using the IAM were identified for 2000-2001. Although multiple published studies cited Beaudrie (2000), an unpublished doctoral dissertation, this dissertation could not be obtained. Despite the initially modest use of the IAM in published studies around the turn of the century, the use of this seminal study and the resulting IAM in grew steadily within the published literature throughout the first decade of this century.

2002. Two studies which used the IAM were published in 2002, according to the database search explained previously.

In an examination of an online community of practice within a Dutch policy organization, De Laat (2002) used the IAM to analyze the social construction of knowledge. Of the 178 coded messages, 72% were classified in the first phase related to sharing and comparing information. There were no messages coded in the fourth or fifth phases of the IAM. These findings are consistent with the results of the majority of studies using the IAM.

That same year, in an editorial summary of the research on learners using computer-mediated communication in distance learning, Moore (2002) called the work of Gunawardena et al. (1997) and the resulting IAM as a "seminal study" (p. 63) related to collaborative learning and the social construction of knowledge.

2003. Two studies were also published in 2003. The first study, conducted by Aviv, Erlich, Ravid, and Geva (2003), examined knowledge construction within structured and unstructured asynchronous learning networks in a business ethics course. Each of the 70 messages in the unstructured network was coded within Phase I. In contrast, the structure of the other network was focused on a series of steps guiding the learners through higher phases of

critical thinking. Thus, it is not surprising that 58% of the 248 messages in the structured network were coded in the fourth phase of the IAM, with only 5 messages coded in Phase V.

That same year, Brace-Govan (2003) used the IAM in the development of a moderator's assessment matrix. Brace-Govan pointed out the consistency of the IAM with other tools such as the taxonomy of epistemic tasks of Ohlsson (as cited in Goodyear & Zenios, 2007), the critical thinking model of Garrison et al. (2000), the group process typology of Tuckman (1965), and the conference progression model of Salmon (2000). Brace-Goven commented that the IAM had "intuitively recognisable progressive categories" (p. 317) that were useful in the pursuit of creating a moderator's assessment matrix.

2004. In 2004, three studies were published that used the IAM. In the first study, cross-national research of online learning (Volet & Wosnitza, 2004) used the IAM and concluded that it was "well suited for revealing how participants were responding to each other's contributions and what level of social construction of knowledge they were engaged in" (p. 16). Similar to the findings of Kanuka and Anderson (1998), in which 92% of the discussions posts were within the first phase of the IAM, the majority of discussions posts in Volet and Wosnitza's study related to only the first phase, indicative of a lack of knowledge construction as demonstrated in the transcript.

Another study from the same year (Hendriks & Maor, 2004) also used the IAM with similar results. Although the researchers did not attribute actual numbers to each phase of the IAM, after analyzing the transcripts of the 14-week post-graduate course, the researchers noted that the majority of the participants' "communicative strategies" (p. 26) fell into the first and second phases of the IAM. The researchers concluded that the IAM was "useful as a preliminary means to analyse and understand the kinds of communicative strategies taking place within a community of learners" (p. 28).

In a comparison of the IAM with the critical thinking protocol of Newman et al. (1995), Marra, Moore, and Klimczak (2004) determined that the IAM does produce its intended results, a key element in establishing validity. In addition, the Marra et al. noted that "the IAM produced very descriptive results because of the thick and rich descriptions that define each phase" (p. 34).

2005. The following year, the number of published studies using the IAM grew to five.

Schellens, Van Keer, and Valcke (2005) used the IAM to examine differences in knowledge construction with the assignment of discussion roles. The IAM was chosen because the researchers thought it was "better suited to discriminate among the more advanced levels of knowledge construction" (p. 720). The mean level of knowledge construction did not differ with the treatment of role assignment. In both groups, the majority of posts occurred within the first two phases of the IAM, thereby continuing to corroborate the findings of previous studies. Interestingly, Schellens, Van Keer, and Valcke also concluded that both student and task characteristics significantly influence students' mean level of knowledge construction.

Schellens and Valcke (2005) published in that same year another study using the IAM. In this study, the IAM was compared to a similar typology developed by Veerman and Veldhuisen-Diermanse (2001). More than half (51.7%) of the 1,343 messages were coded within the first phase of the IAM. In addition to the consistency of these findings with previous use of the IAM, Schellens and Valcke concluded that their results "underpin the theoretical position of both models that identify phases in knowledge construction" (p. 872).

Also in 2005, Luebeck and Bice (2005) explored conceptual change among mathematics and science teachers in a graduate course on models of assessment. The IAM was selected after a review of existing measures for evaluating computer conferencing because the researchers felt

that the IAM "was most capable of detecting cognitive conflict, analogous thinking, reflection, and higher-order cognitive processes" (p. 28). Of the 484 messages coded, 60% were in IAM's first phase, consistent with the findings of previous research.

In two sections of a graduate level instructional design course, Moore and Marra (2005) examined the effect of participation protocols on knowledge construction. Messages in either Phase I or Phase 2 of the IAM represented 68% of the 249 messages that were coded. The researchers noted at this time that the IAM was already "well used" (p. 198) and "one of the most frequently used online content analysis models currently available" (p. 198).

The final use of the IAM in the literature published in 2005 comes from Yang, Newby, and Bill (2005). In an interrupted time-series quasi-experimental design using the teaching and modeling of Socratic questioning as an independent variable, the researchers coded 947 messages, 68% of which fell within the first phase of the IAM. The highest percentage of Phase 1 messages were generated before Socratic questioning was introduced.

2006. Five studies using the IAM were also published in 2006. The first, conducted by Jamaludin and Lang (2006), used the IAM to evaluate the transcripts of primary students in Singapore during a 10-week cross-school project. The findings from the IAM were triangulated with data from reflection logs and open ended questions. There were 354 coded messages, of which 65.8% were in Phase I. There were no posts coded in Phase V.

Lu and Jeng (2006) assessed knowledge construction among in-service teachers engaging in online professional development in instructional technology. Consistent with other studies using the IAM, 93% of the 715 coded messages were within the first phase. In addition, the researchers commented on the IAM's ability to provide researchers "with more specific codes to investigate the knowledge construction process" (p. 184) and "a more holistic view of discussion flow and knowledge construction" (p. 184). Lu and Jeng also noted the IAM's "frequent use by many researchers" (p. 188).

Using the IAM to examine the transcripts of four small groups in a 12-week online graduate course, Paulus (2006) introduced the idea of functional moves to expand the 183 messages into 471 conceptual functional moves. Of these 471 functional moves, 71% were coded as Phase I. On an interesting side note, Paulus concluded that the IAM and similar models took a challenge approach to knowledge construction while some participants in online discourse engaged in a connect approach to knowledge construction.

Stansberry (2006) examined12 library and information science courses with a total of 38 online discussion questions: 22 questions rated seen as literature-based and 16 were rated as not literature-based. Altogether, 79% of the discussions across both types of questions were coded in the first two phases of the IAM.

In a study of instructional design for online wisdom communities, Gunawardena, Ortegano-Layne, Carabajal, Frechette, Lindemann, and Jennings (2006) compared the knowledge construction expressed in concept maps with those expressed within the discussions, using the IAM as the content analysis tool for evaluating the discussions. The results found that the both the discussions and the maps shared propositions socially constructed and that some concept maps, created after the discussions, extended the knowledge construction that occurred within the discussion. Although this particular study did not provide data such as number of messages overall and numbers of messages coded in each phase, the study does illustrate another way that the IAM is being used in innovative education research.

2007. Four published studies that used the IAM were identified in 2007. Building on her previous work (Hendriks & Maor, 2004), Maor (2007) again used the IAM as the basis of her

transcript analysis. The first phase of the IAM – sharing and comparing information – accounted for 61% of all the posts. That same year, Skinner (2007) used the IAM to investigate the extent to which online discussions build learning communities. Although exact numbers were not provided for each phase of the IAM, Skinner noted that about three-fourths of the discussion posts failed to relate to the content of the previous message, a necessary requirement for socially constructing knowledge. Once again, these findings are consistent with the results of previous studies using the IAM.

Hou, Chang, and Sung (2007) used the IAM to investigate how 'peer assessment online discussion' influences kno wledge construction in problem-based learning among senior undergraduate students in one information technology course. Of the 262 messages, 89% were coded within Phase I. There were no messages coded in Phases IV or V. The researchers concluded that peer assessment alone was insufficient to generate knowledge construction.

In a study of student, group, and task characteristics in online discussion, Schellens, Van Keer, Valcke, and De Wever (2007) concluded that the amount of contributions and the attitude towards the online learning environment were significant predictors of the level of knowledge construction. Although neither the total number of messages within the 23 discussion groups nor the number of messages in each phase of the IAM was indicated, the researchers indicated that the findings of the study were validated by applying another content analysis scheme (Veerman & Veldhuisen-Diermanse, 2001) with similar results.

Calling the IAM "widely-used" (p. 127), Osman and Herring (2007) used the IAM as one of three tools to study interaction, facilitation, and deep learning in cross-cultural chat. Of the 442 messages analyzed, 46% were in Phase 1 and 18% were in Phase 2. With only 1% of messages coded as Phase 5, and no messages coded in Phase 4, there was no shift toward knowledge construction over time. The researchers concluded, because of the task design and purpose of the synchronous chat, that the later phases of the knowledge construction would have appeared outside of the chat context.

2008. The following year, another five studies using the IAM were published in the selected databases. The first, conducted by Huntley and Thatcher (2008), used the IAM to investigate the relationship between time delay and knowledge construction. Although the number of posts corresponding to each phase of the IAM was not provided, the researchers did conclude that the time delay between initial posting and response did not influence knowledge construction. An interesting finding, however, was that greater numbers of words in a message usually tended to indicate a higher phase of knowledge construction.

A study using face-to-face and online sections, taught by the same professor, of a graduate course on nursing theories was conducted the same year (Cragg, Dunning, & Ellis, 2008). Transcripts of the face-to-face course resulted in 724 codes, 54% of which were coded in the first phase of the IAM. Similarly, transcripts of the online course yielded 420 codes, 65% of which were in the first phase.

Saritas (2008) examined the transcripts of three separate online discussions in a 14-week graduate course for educational practitioners. A total of 414 messages were coded, with the majority (66%) residing in the first phase of the IAM. The researchers suggested that these results could have been influenced by the lack of structure and facilitation within the discussions.

Tan, Ching, and Hong (2008) used the IAM to analyze the small group knowledge building effort among teachers in a 13-week graduate course. Of the 530 coded messages, 80% were coded as Phase 1. The researchers suggested four reasons for the low levels of knowledge construction: knowledge building capacity, social practices of participants, role of the course

facilitator, and time constraints. In addition, the researchers suggested that more scaffolding may be necessary for knowledge construction.

Yang (2008) used a quasi-experimental design involving Socratic questioning in a large university class in Taiwan. The total number of units of analysis in the study was 11,697, of which 97% were coded within the first phase. In addition, Yang found a significant difference between the experimental and control groups, leading to the conclusion that the use of Socratic questioning increased the quality of interaction among the students.

2009. Consistent with previous years, five studies using the IAM were published in 2009. De Wever, Van Keer, Schellens, & Valcke (2009) continued their previous work with the IAM in their study of the impact of role assignment and self-assessment on knowledge construction in online, asynchronous discussions over a 12-week undergraduate course. Although specific numbers of messages coded into each phase were not provided, the study did indicate the difference between the levels of knowledge construction measured using the IAM and the perception of knowledge construction reported by the students. The researchers concluded that students underestimated their Phase 1 contributions and overestimated their contributions to the other four levels of knowledge construction according to the IAM.

In their experimental design to measure the impact of instructional strategy, Hull and Saxon (2009) noted the utility of the IAM to measure social construction of knowledge. Of 792 coded messages, the mean rating was 3.2. Since the researchers adapted the IAM by including two other phases, this mean score represents the construct of situated definition, a state that occurs before the negotiation of shared meaning. Thus, the results of this study are similar to other studies in that the majority of postings did not reach higher levels of knowledge construction. The researchers also noted that frequency of interaction was unrelated to the co-construction of knowledge. Furthermore, the researchers concluded that online methods of instruction depended upon the effectiveness of the instructor in establishing "a line of questioning that supports inclusion and targeted discussion with questioning that requires participants to bring new information to the group that is relevant based upon consideration of what others have already suggested" (p. 636).

Onrubia and Engel (2009) used the IAM to understand the relationship between particular writing strategies and knowledge construction in two online courses. The researchers adjusted the IAM to four phases, which the researchers asserted was closer to the small group task design of the writing project. The majority of the 1,140 messages was coded in the phase of exploration, which lacks questioning or critique of previous statements and is consistent with other research using the IAM in which knowledge construction remains at the lower levels of interaction.

2010. The use of the IAM continued to grow, with six published studies identified in the first six months of the year. These results continue to corroborate the findings of previous research using the IAM.

Boulter (2010), in her study of undergraduate business students, noted that 85% of posts were in the lowest phase of the model in both the treatment and control groups. Similarly, Heo, Lim, and Kim (2010) used the IAM to assess knowledge construction in a study focused on problem-based learning. As with previous studies, 60% of the posts fell into the first two phases of the IAM. One interesting find was that the group with the highest number of interactions was also the group with the highest percentage of posts coded within the first two phases. This result is another reminder that *quantity* of interaction does not equate to *quality* of interaction.

Daher (2010) used the IAM in a study of mobile mathematics education among middle school students and concluded that the students reached all phases of the IAM. Unfortunately, neither the total number of codes for each phase nor inter-rater reliability was provided.

De Wever, Van Keer, Schellens, and Valcke (2010) continued their use of the IAM in their study of roles in knowledge construction. The 12-week course resulted in 4,816 messages, of which 71% were coded within the first phase. In their conclusion, the researchers noted a positive effect from role assignment on knowledge construction when the roles are introduced at the beginning of discussions. It should be noted that, not only do these findings continue the accumulation of data on the validity and reliability of the IAM, but also that these researchers have returned to the IAM as their instrument of choice to measure knowledge construction.

In an analysis of participation and interaction among high school students in an online asynchronous discussion environment, Lang (2010) found 83% of the 8, 415 messages fell within Phase I of the IAM. Lang concluded that high schools students probably face challenges associated with learning, teaching, and implementation that contribute to their low level of knowledge construction.

Li (2010) used the IAM to study discourse in a web-assisted, undergraduate mathematics education courses. The indicators of each phase were adapted to suit the nature of mathematic discussions. Different from previous studies, the results of Li's work indicated that only 21% of the 204 messages were coded in the lower level. These findings could be different from other studies because of the objectivist nature of mathematical education or the lower number of total messages as compared to the number of messages in other studies.

In summary, several elements of support for the IAM can be extracted from this accumulation of consistent data in 40 published studies spanning 14 years. One element of support is the growing use of the IAM since its development in 1997, as illustrated in Figure II.

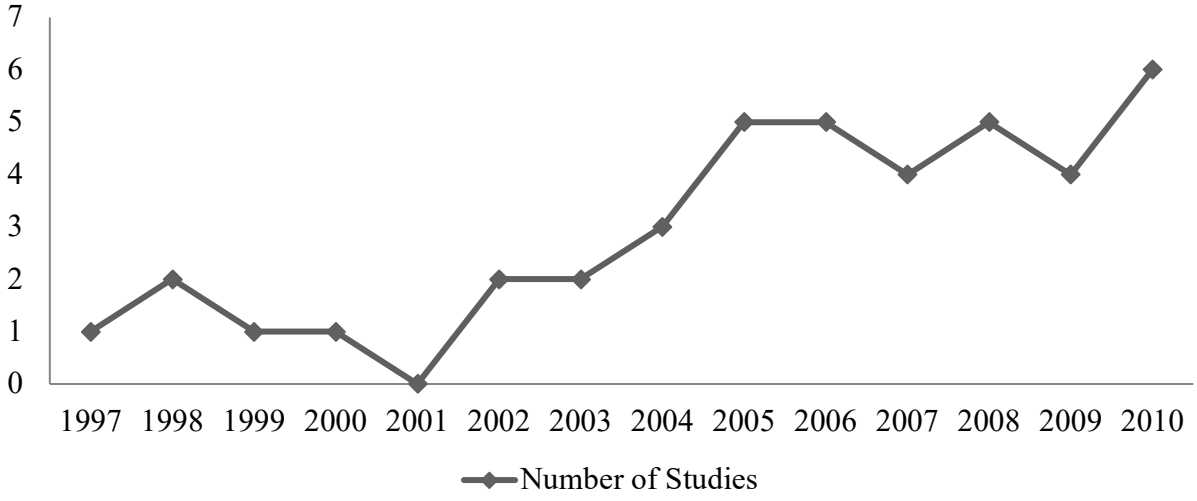

Figure II. Number of published studies using of the IAM between 1997 and June 2010.

Inter-Rater Reliability of IAM

Another element of support for the IAM comes from the high levels of inter-rater reliability among the 22 publications in which the measure is reported. Measures of inter-rater agreement, after resolution, in these published studies are summarized in Table III. An average

measure of inter-rater reliability would be invalid because of the different methods used to calculate each statistic. In addition, some studies reported ranges rather than exact numbers.

Table III

Reported measures of inter-rater agreement, after discussion, using IAM

Study	Cohen's κ	Krippendorff's α	Cronbach's α	Other	Method Not Provided
Luebeck & Bice (2005)	.83				
Moore & Marra (2005)	.61	.93			
Schellens & Valcke (2005)			.88-.99		
Schellens, et al. (2005)				.90[a]	
Yang et al. (2005)				.93[b]	
Jamaludin & Lang (2006)	.82				
Lu & Cheng (2006)	.76				
Hou et al. (2007)	.73				
Maor (2007)					
Osman & Herring (2007)					>.80
Schellens et al. (2007)			.87		
Huntley & Thatcher (2007)	.94				
Saritas (2008)					>.80
Yang (2008)	.91				
De Wever et al. (2008)		.40 < > .80			
Hull & Saxon (2009)	.77				
Ke & Xie (2009)					.87
Onrubia & Engel (2009)					> .90
De Wever et al. (2010)		.52			
Heo et al. (2010)					.86
Li (2010)				.839[c]	
Lang (2010)	.85				

[a] Holsti's percent agreement. [b] Miles & Huberman's percent agreement. [c] Pearson's *r* ($p < .001$)

Conclusion

One characteristic of virtual learning communities (VLCs) is the use of threaded discussions, such as the type of discourse that occurs within many online course rooms. In online course rooms that seek to facilitate knowledge construction, the discussion board is the most common space in which this collaborative knowledge construction is demonstrated. Given the prominent role that these discussion areas play, Mäkitalo-Siegl (2009) called the discussion boards the "life blood and center of energy" (p. 55) for the online course. Thus, having effective instruments to measure the quality of discourse within threaded discussions is an important component of evaluating VLCs.

Instructional designers need to be able to assess the level of knowledge construction generated within the discussion boards of an online course that subscribes to a social constructivist framework. Assessing the level of knowledge construction enables course revisions in order to increase the quantity or quality of the knowledge construction. Content analysis is an established method used to the transcripts of online course rooms. The validity of the Interaction Analysis Model (IAM) of Gunawardena et al. (1997) has been established through the method of its development and the accumulation of consistent data in 40 published studies spanning 14 years, including the high levels of inter-rater reliability among the 22 publications in which the measure is reported. As suggested by Rourke and Anderson (2004), researchers looking to use content analysis should use existing, suitable protocols rather than developing their own. The IAM is an existing, validated protocol for the content analysis of course room transcripts and, thus, an important instrument in the evaluation of VLCs.

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