Learning to Grow

The development of educational groups in a synchronous environment

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Abstract—**This paper analyses the synchronous discourse of group of students engaged in a series of workshops. The results indicate that groups in the educational environment exhibit both short-term and long-term developmental trends, thus providing a better understanding of how online learning communities develop and grow.**

Group development, elearning, synchronous communication

I. INTRODUCTION

Groups, like individuals, experience a cycle of development over time. There is a preponderance of evidence for the existence of developmental phases in face-to-face groups but less is known about how virtual groups develop. Even less is known about the development process of groups in the educational environment. The evidence for developmental phases in face-to-face groups is based, by and large, on either observation or content analyses of verbal communication patterns. In the former case, conceptual categories associated with the stages of group development are determined prior to observation and then the units of analysis (e.g. sentence, utterance, conversation turn) are classified as one or more of the predetermined categories [e.g. 1]. In the latter case, categories or themes emerge as the content of group discussions are examined. Thematic shifts are an indication of turning points in a group's life cycle [2].

Models of group development abound in the literature. Some well-known examples include: Bales' [3] IPA framework, Tuckman's [4] five-stage model; Hare and Naveh's [5] LAIG model; Lacoursiere's [6] five-stage model; Gersick's [7] punctuated equilibrium model; Worchel et al.'s [8] six-stage model; and Wheelan and Hochberger [9] five-stage integrative model. While many of these models may be described as mechanistic and reductionist, there is ample evidence that a characteristic lifespan does exist for face-to-face groups.

Research in the developmental cycle of virtual groups is much more sparse than for their traditional counterparts. Nagel [10], for example, defines a sequential model of six phases. However, most of the research on virtual groups has been carried out with virtual teams in the organisational setting. Virtual teams have been described as "cross-functional teams that operate across space, time and organizational boundaries with members who communicate mainly through electronic technologies" [11].

Whereas groups are, and always have been, an integral part of society, we are now experiencing the most dramatic change in the nature of groups, particularly in the educational environment. Teams of students are moving from being primarily co-located to virtual. Most studies comparing traditional and virtual teams favour the effectiveness of traditional teams, reporting that traditional teams have more interaction and information exchange [12], less misunderstanding among members [13], and superior internal leadership and coordination [14, 15]. Critics of this body of research, though, argue that the findings were limited in that the groups were ad hoc and the time period insufficient to establish effective working relationships. More recent research suggests that if virtual teams have sufficient time to develop strong relationships and adapt to the use of computer-supported collaborative technologies, they may be just as effective as traditional teams [16-19].

In the higher educational environment, virtual teams are similar to the organisational team in that they have a defined but non-routine task, they collaborate over a predetermined length of time, the team has the authority to make decisions regarding the task (albeit somewhat limited) and membership is generally fixed rather than fluid. In online degree programs, virtual learning teams are being used to increase collaboration, communication, learning [20], interaction [21], and knowledge sharing [22]. Landrum and Paris [23] found that virtual teams in higher education do, in fact, pass through developmental stages commonly associated with traditional teams. In their virtual team project across two universities, students found communication difficult. Asynchronous communication was counter-productive and a hindrance to the development of ideas, and synchronous communication was difficult to coordinate across different time zones.

This research attempts to determine through a case study if virtual teams in a synchronous educational setting exhibit a developmental process and, if so, what types of communication are typical in different stages.

II. CASE STUDY

Organisational Informatics was an undergraduate course in an Australian university which examined a range of contemporary information systems topics, concerning organisational, social and cultural aspects of the design and development of information systems. The course materials included a collection of papers covering topics which were

used to inform a series of workshop discussions. Each workshop was devoted to a specific topic. The chat room in the learning management system (WebCT) was used as virtual spaces for the workshops. For each workshop, all students were required to read the same paper(s) related to the corresponding lecture topic, and one student was assigned to lead the discussions (i.e. to act as a moderator). Guidelines for moderating, based on evaluation criteria, were available for the students to download from the web site. The moderating task involved preparing a brief critique of the articles as well as questions, that highlighted the main issues of the articles, to stimulate discussions.

After each workshop, all students were required to submit a journal, reflecting on the readings and discussions. The reflections were an important feature of the workshop design as they reinforced the learning that occurred during the workshop, and provided the opportunity for self-evaluation and thus improvement in subsequent weeks. It also provided a feedback mechanism for the instructor.

There were nine workshops over a period of three months, interspersed with two short study breaks. The workshop series was a novel approach to group work as most of the participants had never met, either online or offline. As group members went through the process of collaborative learning and knowledge construction through discussions and citations, they built a social and intellectual foundation that strengthened and sustained the collaborative activities.

III. METHODOLOGY

A. Participants

The course had an enrolment of 99 students who were assigned to seven workshop groups of approximately 16 members. The author was the instructor.

B. Data

The data sources for the analysis and evaluation of the virtual workshops were the discussion transcripts, which were automatically logged by WebCT. At the end of each workshop, the logs were downloaded by the instructor. Extraneous data, such as false entries and program bugs, were deleted. The cleaned file was then uploaded to WebCT. Transcripts were thus available to students immediately following each workshop.

Of the seven workshop groups, the data from three groups were incomplete due to various organisational and technical problems. The remaining four groups were content analysed. The total number of utterances in each of these four workshops was 5,697, 6,328, 4,547 and 3,869. (An *utterance* is defined in this study as "everything said by one speaker before another began to speak" [24]; in a chat room, this means the enter key defines the end of an utterance.) The results of one series of workshops (Group 1) are reported here.

Group 1 had a total of 5,697 utterances. Even though the nine workshops were of the same duration of one hour, the number of utterances in each workshop differed, ranging from 363 utterances in Workshop 3 to 802 utterances in Workshop 2.

A coding scheme was developed to analyse the content of communication (Table 1). The discussion transcripts were transferred to an Excel spreadsheet and each utterance was coded according the presence of one or more categories as described in the coding scheme. The categories provided the means for observing the emergence of *turning points*. Turning points are defined as a point in the discussion at which changes occur in the presence of a combination of dimensions [25]. A turning point, therefore, delineates the beginning and end of a phase in group development.

TABLE I. CODING SCHEME OF COMMUNICATION TYPES

Category	*Code*	*Description*
Task	TSK	Deals with the collaborative activity of the group.
Conceptual	CON	Involves the creation of mutual understandings and meanings among participants, including procedures to follow, work to be completed.
Supportive	SUP	Content having the capacity to support another participant emotionally.
Argument-ative	ARG	Content having the capacity to trigger/maintain an argument or conflict.
Social	SOC	Content dealing with interpersonal relationships and social activities.
Environ-ment	ENV	Content related to use of environment in which communication occurs.
Awareness	AWA	Content about making knowledge of self and other participants(s) explicit to increase social awareness.
Informal	INF	Content about the collective informal creation, management, and enforcement of communication norms.
Formal	FOR	Content about the enforcement of rules or norms.

IV. RESULTS

Since each workshop had the same aim of learning through a collaborative activity, it could be that the nine workshops represent a group's lifecycle repeated nine times. Or it could be that there are some effects over the period of the nine workshops. In other words, developmental effects may be evident both within and across workshops. Therefore, the workshops were analysed for both short-term (within workshops) and long-term (across workshops) developmental characteristics.

All nine workshops were analysed in detail and displayed similar characteristics. An analysis of the short-term developmental characteristics of one workshop (Workshop 1) will be reported followed by a briefer report of the other eight workshops. Data for all nine workshops were then averaged to determine consistent short-term developmental trends. The results of the nine workshops were then analysed for long-term developmental trends.

A. Development Characteristics within Workshops

a) Workshop 1

A total of 474 utterances were exchanged by participants throughout the one-hour topic discussions in the first workshop. This workshop was characterised by a significant amount of task (TSK=39.0%), conceptual (CON=28.1%) and

social (SOC=18.6%) communication. In addition, approximately one in twelve utterances were concerned with explicit self-disclosure or knowledge about other participants (AWA=8.0%). Generally the group was more supportive than confrontational (SUP=4.9% compared with ARG=0.0%). Small but approximately equal amounts of informal and formal management of communication were used (INF=4.6%, FOR=5.1%).

To visualize the communication, the presence of a communication type in each utterance was plotted. A graph was generated to indicate the temporal sequence of combinations of communication types [26] (Fig. 1). The timeline illustrates that, at the commencement and conclusion of the workshop, the participants engaged in social, conceptual and awareness communication. Almost all task-oriented communication was confined to the middle section of the workshop, along with some supportive comments. The timeline therefore indicates two obvious regions which signal a transition from one general style of communication (combination of coding categories) to another combination. These regions are indicated in Fig. 1 by vertical dotted lines.

Subsequent detailed scrutiny of the content of utterances in those transition regions revealed particular utterances that significantly altered the communication of the group. The first transition (i.e. the point between Phase 1 and Phase 2) was at utterance u_{151}. The moderator announced that she would lead the discussions on two articles, thus focusing everyone's attention on the workshop task:

> [Sandy]: Ok...well I have choosen a reading from week 1 ... I'l start with... (u_{151})

The second major transition occurred with the discussions becoming more reflective at utterance u_{338} when a participant made the following comment:

> [Duncan]: Would this disscussion go better if we were all in the same room talking (u_{338})

The changes in the nine communication categories in the three development phases are shown in Fig. 2. The graph represents the percentage of each variable with respect to the total number of utterances in each phase. It can be seen that when the group was engaged in task-related communication, there was almost no conceptual or social communication. In Phase 1 and Phase 3, when task activity was low, there was increased conceptual and social communication.

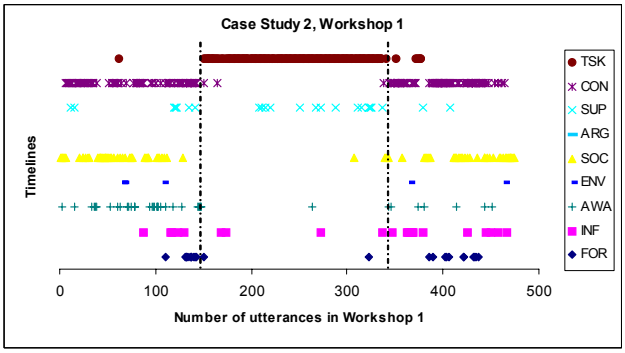


Figure 1. Communication timeline of Workshop 1.

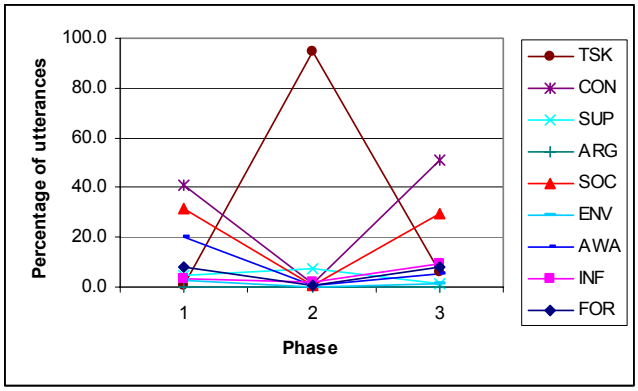


Figure 2. Communication types in three phases of Workshop 1.

As most of the participants had never met each other, the communication included disclosures about themselves to increase social awareness of each other.

> [Kirk]: I love this, i can drink coffee and listen to music whilst attending a tute heheh (u_{75})
>
> [Duncan]: I am at home...in my pajamas drinking coffee hehehehehehe...this is so sweet (u_{102})
>
> [Kevin]: i am much more comfortable on a pc rather than talking to a group of ppl... (u_{346})

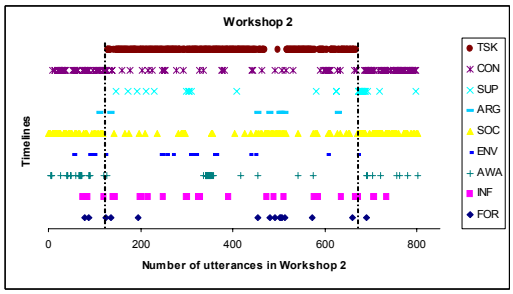
These results demonstrate three developmental phases in the first workshop. Broadly, the first phase was concerned with "getting to know you" (SOC, AWA) and pattern establishment (i.e. establishing norms of communication behaviour) (CON). The second phase was concerned with "getting on with the task" (TSK). The third phase was concerned with "this is what we did"; that is, reflecting on the task process (CON) and social interaction (SOC) to build integration and cohesiveness. There was a small proportion of supportive and no argumentative communication. What little supportive communication there was, occurred mostly in Phase 2, and took the form of concurring with other participants' comments, for example:

> [Adrian]: i think sandy has a point ... (u220)
>
> [Sandy] i agree doug … (u311)
>
> [Doug]: that's a good point duncan (u337)

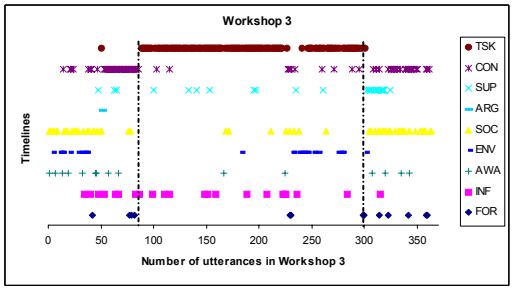
b) Workshops 2-9

In this section, a brief analysis of Workshops 2-9 is provided. Figs. 3a-h show timelines for Workshops 2-9 with turning points indicated by dotted lines.

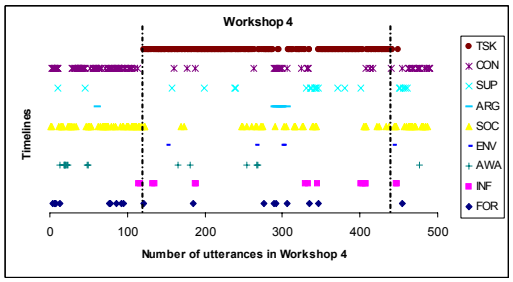
All timelines indicate similar communication patterns to Workshop 1 (Fig. 1); that is, an initial period of mostly social and conceptual type communication; a middle period of mostly task communication; and a final period mostly conceptual and social communication, reflecting on the task processes and social interaction to build integration and cohesiveness.



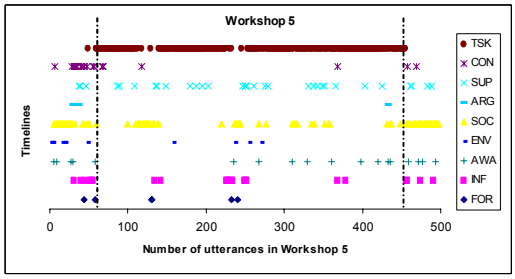
(a) Workshop 2



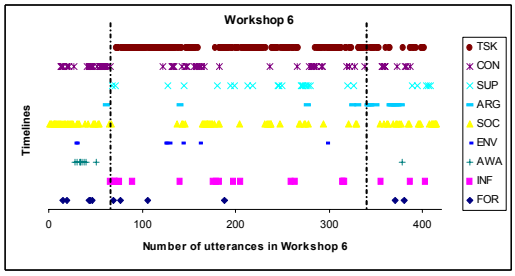
(b) Workshop 3



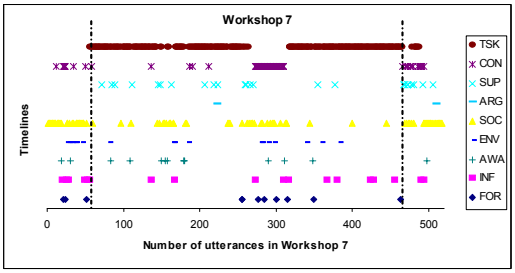
(c) Workshop 4



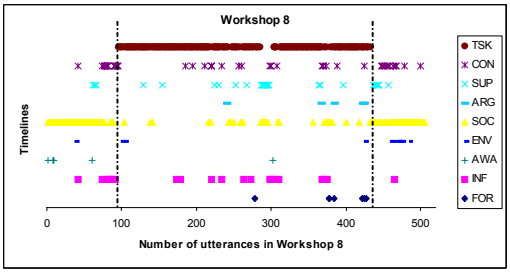
(d) Workshop 5



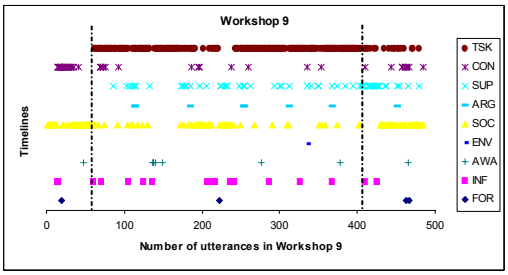
(e) Workshop 6



(f) Workshop 7



(g) Workshop 8



(h) Workshop 9

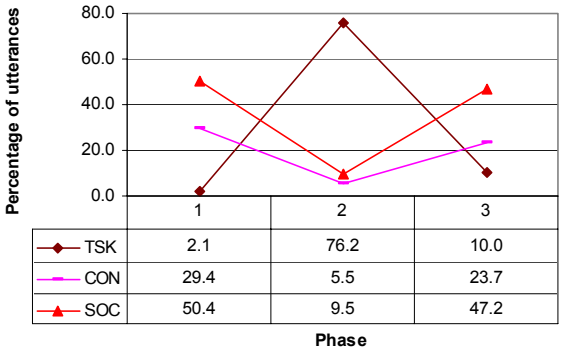
Figure 3. Communication timelines of Workshops 2-9.

c) Workshops 1-9

In this section, the combined results of the nine workshops are presented. For clarity, the communication types are averaged over all workshops and separated into the three most frequent and the six less frequent communication types.

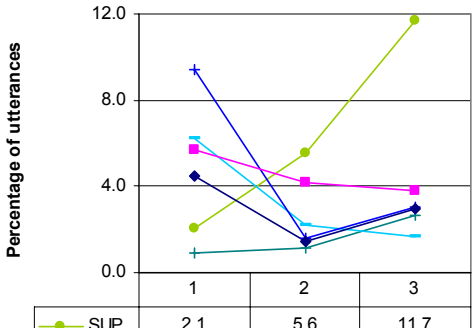
The means of the three most frequent variables (TSK, CON, SOC) are shown in Fig. 4 and illustrate the average communication pattern in the developmental phases for all nine workshops. The figure shows numerical data supporting the broad description of the development of each phase mentioned earlier.

The means of the six less frequent variables (SUP, ARG, ENV, AWA, INF, FOR) are shown in Fig. 5. The most obvious trends are an increase in supportive communication, a decrease in awareness and environment communication, and a decrease in both formal and informal management of communication.



	1	2	3
TSK	2.1	76.2	10.0
CON	29.4	5.5	23.7
SOC	50.4	9.5	47.2

Figure 4. Means of most frequent communication types for nine workshops.



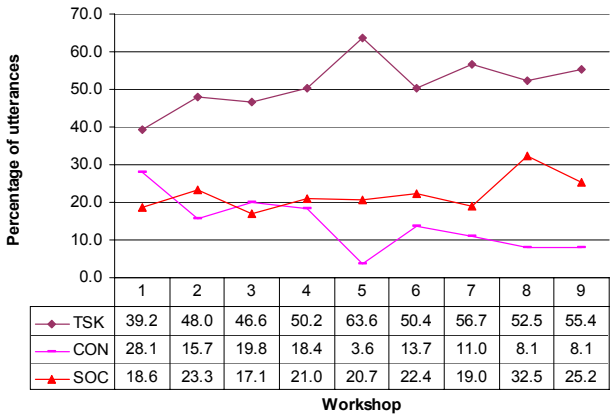
	1	2	3
SUP	2.1	5.6	11.7
ARG	0.9	1.2	2.6
ENV	6.2	2.2	1.7
AWA	9.4	1.6	3.1
INF	5.7	4.2	3.8
FOR	4.5	1.4	2.9

Figure 5. Means of less frequent communication types for nine workshops.

B. *Developmental Characteristics across Workshops*

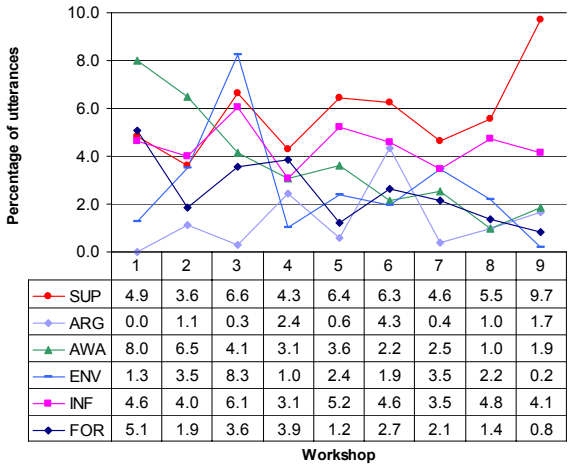
In this section, long-term developmental characteristics (across workshops) will be examined. In terms of development across the nine workshops, Fig. 6 shows trends for the three most frequent variables (TSK, CON and SOC) across each workshop. The trend for task communication is to increase over the period, apart from a high point in the middle. The trend for conceptual communication is to decrease over the period, apart from a low point in the middle. The trend for social communication is to increase over the period.

Fig. 7 shows trends for the six less frequent variables (SUP, ARG, AWA, ENV, INF, FOR) across each workshop. The trend for supportive communication is to increase over the period. The trend for awareness communication is to decrease over the period. The trend for formal communication is to decrease over the period. There are no discernible trends for the argumentative, environment and informal communication.



	1	2	3	4	5	6	7	8	9
TSK	39.2	48.0	46.6	50.2	63.6	50.4	56.7	52.5	55.4
CON	28.1	15.7	19.8	18.4	3.6	13.7	11.0	8.1	8.1
SOC	18.6	23.3	17.1	21.0	20.7	22.4	19.0	32.5	25.2

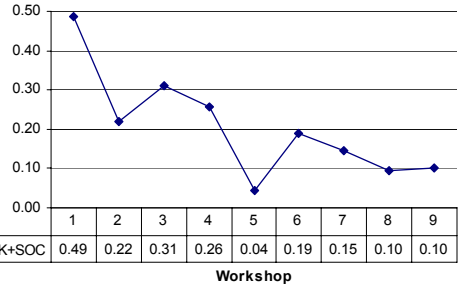
Figure 6. Most frequent communication types across workshops.



	1	2	3	4	5	6	7	8	9
SUP	4.9	3.6	6.6	4.3	6.4	6.3	4.6	5.5	9.7
ARG	0.0	1.1	0.3	2.4	0.6	4.3	0.4	1.0	1.7
AWA	8.0	6.5	4.1	3.1	3.6	2.2	2.5	1.0	1.9
ENV	1.3	3.5	8.3	1.0	2.4	1.9	3.5	2.2	0.2
INF	4.6	4.0	6.1	3.1	5.2	4.6	3.5	4.8	4.1
FOR	5.1	1.9	3.6	3.9	1.2	2.7	2.1	1.4	0.8

Figure 7. Less frequent communication types across workshops.

Although there is more task communication in all phases (workshops), and there is less social than conceptual communication in the first phase, the ratio of conceptual and task plus social categories (Fig. 8) confirms a definite trend of more conceptual communication in the early phases. Fig. 9 shows that the percentage of task is always higher than social communication. In the early phases, task and social communication follow similar patterns, but in the later workshops, there is a trend for task and social to diverge.



	1	2	3	4	5	6	7	8	9
CON/TSK+SOC	0.49	0.22	0.31	0.26	0.04	0.19	0.15	0.10	0.10

Figure 8. Ratio of CON and TSK+SOC communication categories.

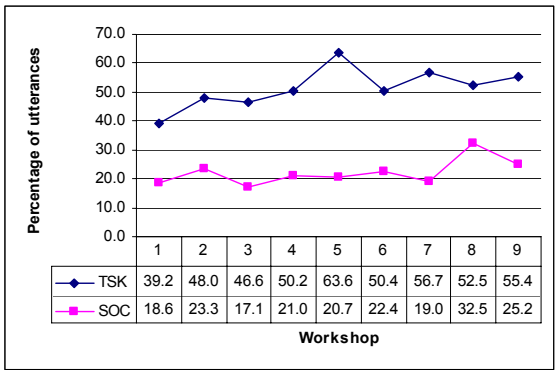


Figure 9. Percentage of TSK and SOC communication across workshops.

V. DISCUSSION AND CONCLUSIONS

The developmental characteristics were analysed for short-term (within workshops) and long-term (across workshops) effects. The analyses demonstrate a strong short-term developmental effect in which the communication in the early and late phases was primarily social and conceptual while the middle phase was task-oriented. In other words, participants tended to focus on conceptual aspects of the group activity and engage in social communication in the early and late phases of development. During periods of high task activity there was minimal social communication.

The developmental effect was not as marked across workshops but there was a definite trend for more task and conceptual communication in the early phases of the workshop series and a trend for more social and supportive communication in the later phases. The weaker effect across workshops is no doubt due to the structured process and environment of the series of nine one-hour workshops. There was a defined commencement and conclusion point for each workshop and very little contact among participants in the time between workshops. This meant that participants needed a short period of "getting to know you (again)" at the start of each workshop. Across all workshops, conceptual communication decreased, and task and social communication increased. However, there was consistently more task than social communication. It appears that having established communication norms and collaborative strategies initially, the participants were able to concentrate more on the collaborative task in the middle and later stages.

While these findings may be specific to the case study analysed in this paper, there is evidence supporting Landrum and Paris's work [23]: that educational groups do exhibit developmental effects.

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