

# Our Way to Taipei - An Analysis of the First Ten Years of the CSCL Community

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**Abstract.** Ten years of international CSCL conferences give proper reason to reflect on the development of the CSCL community. Based on an analysis of conference proceedings, lists of participants and lists of program committee members, this paper provides insights about the development of the CSCL community in its first decade. A focus is set on the continuity of active and passive membership, the geographical distribution and the international connectivity of the community.

Contrary to our expectations, only a relatively small number of people participate continuously in the community. Concerning the geographical distribution we found that the community is increasingly international in conference participation, authors, and program committees. The international connectivity of the community is also increasing which can be seen in a growing number of citations and co-authorships across different countries. These results can serve as a basis for further cultivation of the CSCL community.

**Keywords:** CSCL community, community analysis, citation analysis, social network analysis.

## INTRODUCTION

Since the first workshop in 1989 (Acquafredda di Maratea, Italy; documented in O'Malley (1995)) a growing number of researchers participates in the CSCL community. An international conference series started in 1995, which includes up to now six past and an upcoming conference in 2005. Because of the growing interest on the work of this community an international journal of CSCL (ijCSCL) in printed and online ([www.ijCSCL.org](http://www.ijCSCL.org)) form was founded in 2004. In this paper we present an analysis of the CSCL community over the past ten years to provide a basis for joint reflection which could influence the communities' further development.

The CSCL community can be defined as a scientific community of practice (Kienle & Wessner, 2005). The term "*Communities of Practice*" coined by Lave and Wenger (1991) has been defined as "*groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis*" (Wenger et al., 2002, p. 4). Based on this definition a scientific community – in general as well as the CSCL community – is a community of practice with members working in a common field of research but being distributed across disciplines, organizations, cultures and geographical regions. For their exchange the members use a combination of face to face meetings and increasingly technology-mediated interaction. This results in a heterogeneous group in which members have different views on the (CSCL) community and its main players. Methods used are from a variety of disciplines and scientific cultures. Members follow or even combine practice of basic and applied research (Fischer et al., 2003). For the CSCL community, the development of a common theory which integrates the foundations of the relevant disciplines is ongoing (Stahl, 2002a; Puntambekar & Young, 2003).

In this paper we present an analysis of the CSCL community and its development over the past ten years. We are interested in whether the community coalesces or is a set of – maybe overlapping – sub communities with a special focus on internationality. In more detail, we pose the following research questions:

1. **Development:** How does active and passive membership in the community develop?
2. **Continuity:**
  - a. Do members stay in the community?
  - b. Are new people joining the community and becoming active members?
3. **Connection:** How do the members of the community connect over regional boundaries? Does the connectivity grow over the years?

An informal survey among participants and authors of previous CSCL conferences pointed out that the following results would be expected for the CSCL community:

1. Authors contribute to conferences on a regular basis.
2. A larger percentage of members attend most conferences; in addition there is a sound balance between recurring people and newcomers.
3. The connection over regional boundaries is growing.

This paper tries to provide an objective view on the development and continuity of the CSCL community as well as on the connections in the community. In the following, we describe the methods and data used in our analysis (section 2) and the main results concerning the research questions above (section 3). Based on the results of our analysis we identify issues for further development of the CSCL community (section 4).

## METHOD AND DATA

The analysis of scientific communities often builds on bibliometric and social network approaches. Bibliometric approaches are based on the publications of a community and focus on networks of papers linked by citations. Applicable methods include citation analysis (Garfield, 1979), bibliometric coupling (Kessler, 1963) and co-citation analysis (Small, 1973). Citation analysis looks at the citations in publications and constructs networks between publications. Bibliometric coupling regards two publications are related to the extent they are both together cited in other publications. Co-citation analysis works the other way; two papers are connected to the extent they cite the same publications. Such analyses have been done for fields such as DNA (Garfield et al., 1964), Hypertext (Chen & Carr, 1999), or Information Science (White & McCain, 1998).

Social network approaches (Scott, 1991) to scientific communities are based on the members of a community and focus on networks of people linked for example by co-authorship. It utilizes measures such as connectedness, diameter, centralization and density of a community. This has been applied to a number of research fields, too (see Newmann (2004) for an overview). Social network analysis has been applied also in the CSCL community in order to measure the cohesion in collaborative learning teams (Nurmela et al., 1999; Woodruff, 1999; Cho et al., 2002; Nurmela et al., 2003; Reffay & Chanier, 2003).

Both approaches, bibliometric as well as social network analysis, are used for a formal quantitative analysis of the publications produced by a group and the relationships among publications as well as among members. Especially in academic disciplines where the importance of publication and citation are high, co-authorship and references in the publications can be seen as an indicator of how well members of a field are connected.

For the analysis of the CSCL community we combine several approaches. We perform a citation and co-authorship analysis of the artefacts in CSCL conference proceedings and analyze other sources including the lists of participants and lists of program committee members.

Data for our citation analysis was mainly gathered from the proceedings of the six CSCL conferences in 1995 1997 1999, 2001, 2002 and 2003 (Schnase et al., 1995; Hall et al., 1997; Hoadley & Roschelle, 1999; Dillenbourg et al., 2001; Stahl, 2002; Wasson et al., 2003, Wasson et al., 2003a). Additionally all program committees (CSCL 1995 – 2005) and all available lists of participation (CSCL 1999, 2001, 2002 and 2003) were analyzed. All together we included 692 artifacts (e.g. poster, papers), 125 program committee members (PC members; PCM), 1187 authors and 1462 conference participants in our analysis. PC members, authors and participants together form members of the community. For all members of the CSCL community we recorded the following data:

- **Name**
- **Country and continent.** This data enables us to analyse the distribution of the community.
- **Conference in which she/he participated** as member of the program committee, as author, or as conference participant. On basis of this data we analysed the continuity of the community and transitions between the different degrees of participation.

In addition, we recorded the **discipline** for some participants. Unfortunately, a web search did not provide sufficient answers for most members of the community.

While recording the data we took change of name, typos etc. into account if we could detect or knew about them. The lists of participation we got from the conference organizers were not exhaustive as participants registering on site of the conferences were not included.

For a further analysis of the authors, we recorded for each author contributing to at least three conferences the following data:

- **Co-authors** for the analysis of (strong) interaction between the participants of the community
- **Referenced authors** for the analysis of (weak) interaction between the participants. From the citations of each artifact we picked those people who participated at least once as an author.

To analyze the data concerning the three research questions we carry out the following steps:

- **Development:** For each conference we analyze the absolute number of participants, authors and PC members. For the authors and PC members we also analyze the regional distribution. The comparison of the data for each year enables us to characterize the development of the community.
- **Continuity:** For each author/PCM and conference we analyze if she/he participates for the first or a repeated time. This enables us to show for each conference the number of new and recurring members. The comparison enables us to assess the continuity of the CSCL community. For each member we evaluate at how many conferences she/he participated.
- **Connections in the community:** We take those connections between members of the community into account which can be found in the artifacts printed in the proceedings. These are references as a weak connection and co-authorships as a strong connection. The focus on artifacts is justified because the artifacts represent a major part of what is communicated during the conference and between conferences - as a community memory for its members and as a source for new people joining the community. These artifacts are considered highly valuable to the community by the community itself (via the review process) and serve as a basis for communication in the community. As we are interested in the connections in the community we focus on references to authors inside the community. For co-authorship we limit our analysis to the more active authors, contributing to three or more conferences.

## RESULTS

### Development of the community

Figure 1 shows the absolute numbers of community members in three groups: (conference) participants, authors, and PC members as well as the number of artifacts for each conference. The number of authors as well as the number of artifacts increases over the years. The number of PC members seems to stabilize around a value of 50-60. However, the conferences in Europe (2001 and 2003) attracted fewer participants than conferences in North America (1995, 1997, 1999 and 2002).

Concerning the regional distributions of the conferences we focus on authors and PC members as active members of the community. As the granularity of analysis we selected continents. In figure 2 we see at the left side the composition of authors at the six past CSCL conferences. Participation of European authors was strongest in those years where the conference took place in Europe. Participation of North American authors was strongest in the all other years where the conference took place in North America. Interestingly, following the first conference in Europe (2001) the share of European authors increased also in the following conference (2002) in North America. This means that a small but substantial percentage of the authors not only enter the community when the conference is located nearby but stay from there on for a while in the community, i.e. continue to participate in following conferences.

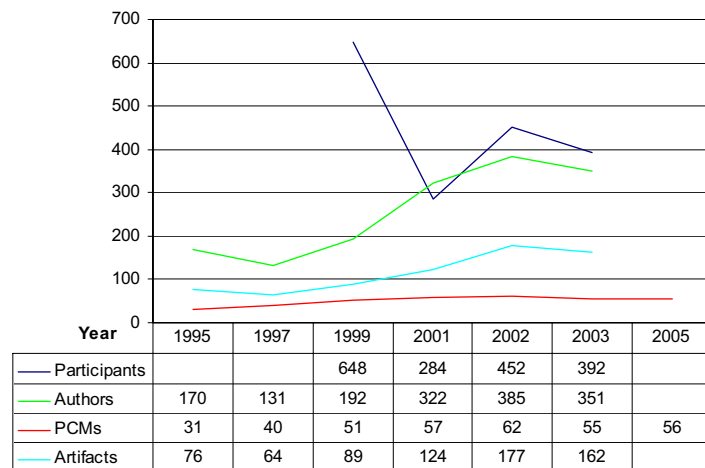


Figure 1: Number of community members and artifacts

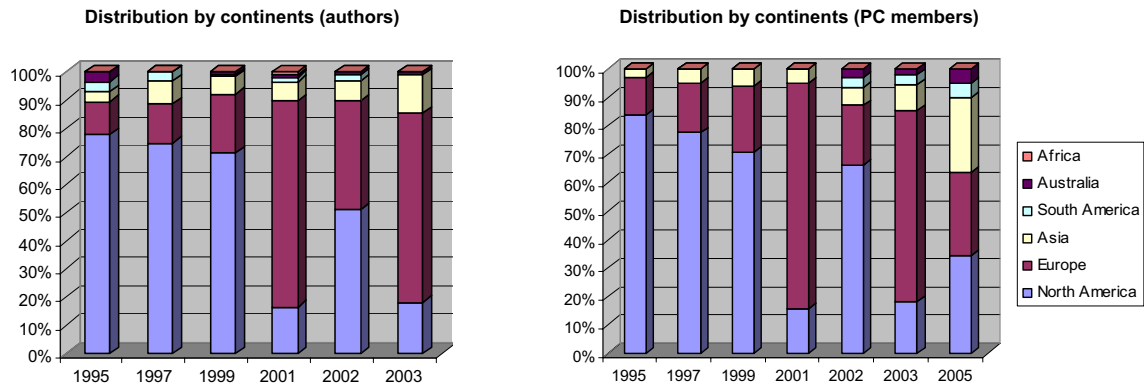


Figure 2: Distribution of authors and PC members by continents

The distribution of authors is quite similar to the geographical distribution of the PC (see right side of figure 2). The similarity can be explained by rotation of meeting places and international composition of program committees. A study concerning the International Conference of the Learning Sciences (ICLS) shows the same relation in a different direction: No rotation of meeting places and program committees with members mainly from one country corresponds with a low degree of internationality in the group of authors (Kirby et al., in press).

### Continuity

In order to assess the continuity we look at all three groups: participants, authors and PC members and at the number of conferences in which they were involved (see figure 3). In each of these groups we found different degrees of participation, taking the number of conferences in which the community members were involved as a measure.

Surprisingly, about 80% of all authors contributed only to one conference.

About 20% of all authors contributed to at least two

conferences, and only 7.4% of authors (88 out of 1187) contributed to at least half of all passed conferences (three or more). The distribution of PC members point into the same direction but shows more continuity for this group: 50% of all PC members were involved in only one conference. As we have participation data for four conferences only, the percentages for participants are not fully comparable to the other two groups. But we see a similar distribution here: 68.5% of participants attend only one conference and only 15 persons were present at each of the last four conferences.

Based on these findings we started a first deeper analysis which shows the quotient of new and recurring authors and PC members for each conference. The results are shown in figure 4. For both groups – authors and PC members – the absolute number and the quotient seem to stabilize. For the PC members, the absolute number is around 50 – 60, the number of new PC members at around 20 (or 33% of all PC members for a given year). For the group of authors, the absolute number is around 350-400, the number of new authors at around 230-250 (or 66 % of all authors of a given year). This indicates for both groups a relatively stable quotient of “old boys” who know and represent the existing ideas of the community and “newcomers” who bring new ideas to the group. However, the part of newcomers in the group of authors is higher than in the group of PC members.

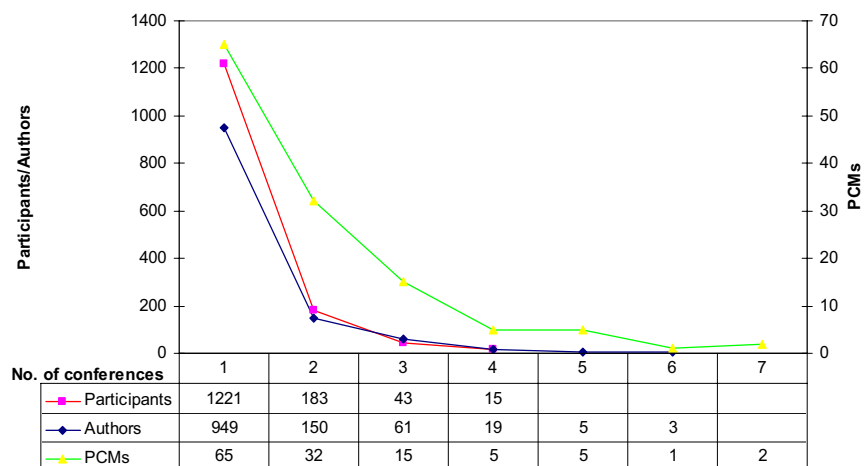


Figure 3: Distribution of participants in three groups

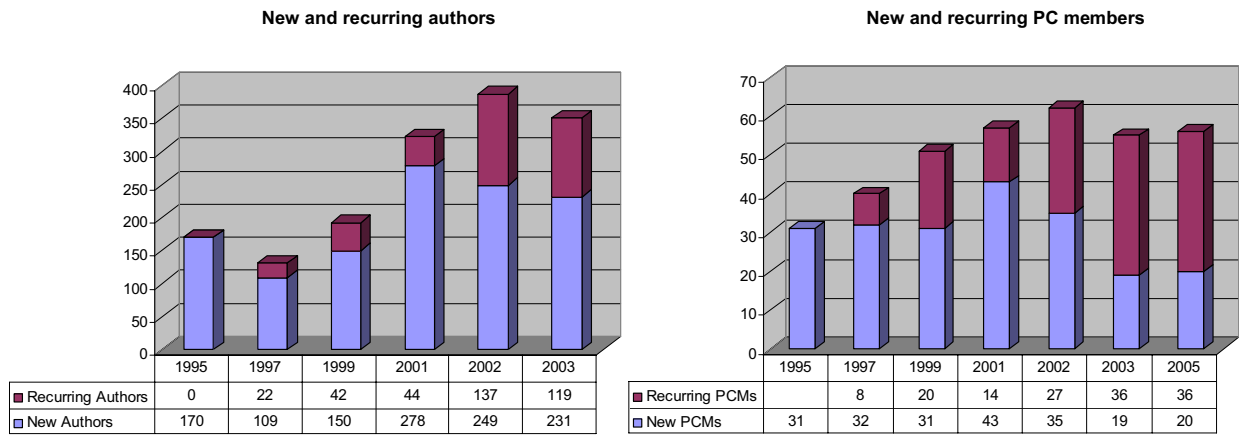


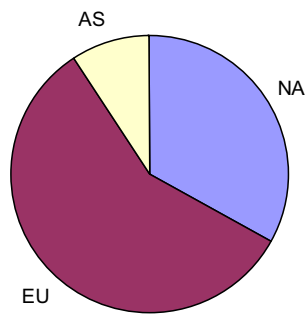
Figure 4: New and recurring authors and PC members for each conference

A second deeper analysis concerns the “key player” of the community: we take a closer look on those members who participated as authors or PC members in three or more conferences. Table 1 lists those authors and PC members who participated in four or more conferences. One interesting point is that the intersection of those two groups is relatively small (see the names in italics in table 1). Based on this result we added those authors and PC members which participated in three conferences. Figure 5 shows their distribution sorted by continents. This reveals a higher continuous engagement of North Americans in the Program Committees on the one hand, and more continuously active authors from Europe on the other hand.

No. of conf.	Authors		PC members
4	L. Dirckinck-Holmfeld D. C. Edelson G. Erkens G. Fischer M. Guzdial <i>U. Hoppe</i> G. Kanselaar V. Kaptelinin J. L. Kolodner F. Kusunoki	M. Lakkala T. O'Shea S. Puntambekar E. Scanlon R. B. Smith E. K. Sorensen M. Sugimoto H. Suzuki B. Wasson	Michael Baker Y. Engeström <i>K. Hakkarainen</i> E. Lehtinen H. Ogata
5	A. Fjuk L. Gomez <i>K. Hakkarainen</i> C. Hmelo-Silver L. Lipponen		C. O'Malley P. Dillenbourg R. Pea <i>U. Hoppe</i> <i>D. Suthers</i>
6	<i>T. Koschmann</i> G. Stahl <i>D. Suthers</i>		J. Roschelle
7			<i>T. Koschmann</i> N. Miyake

Table 1: Authors and PC members who participated in four or more conferences (intersection in italics)

Authors at three or more conferences,  
sorted by continent



PCMs at three or more conferences,  
sorted by continent

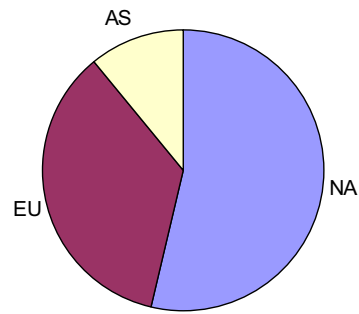


Figure 5: Authors and PC members at three or more conferences, by continents

### Connections in the community

Connections in the community can be found by analyzing references and co-authorships. First we look at the references which we rate as a weaker connection than co-authorships. Figure 6 shows the references for the 1995 conference, figure 7 for the one in 2003. The figures include the references to all authors in the community in artifacts of the Top-88 authors (who contributed to at least three conferences). At a first glance it is seen that the number of nodes (=authors + referenced authors) increases from 1995 to 2003. This is not surprising because the number of authors increases and more CSCL related papers exist, e.g. in proceedings of previous conferences. But the interesting point in these figures is the growing number of international references. While in 1995 most references are national, in 2003 international subgroups arise. Concerning the large network in the middle of figure 7 it should be pointed out that national sub-groups (e.g. from France, Greece, Finland, Sweden, Canada, USA) grow together by referring to the same authors.

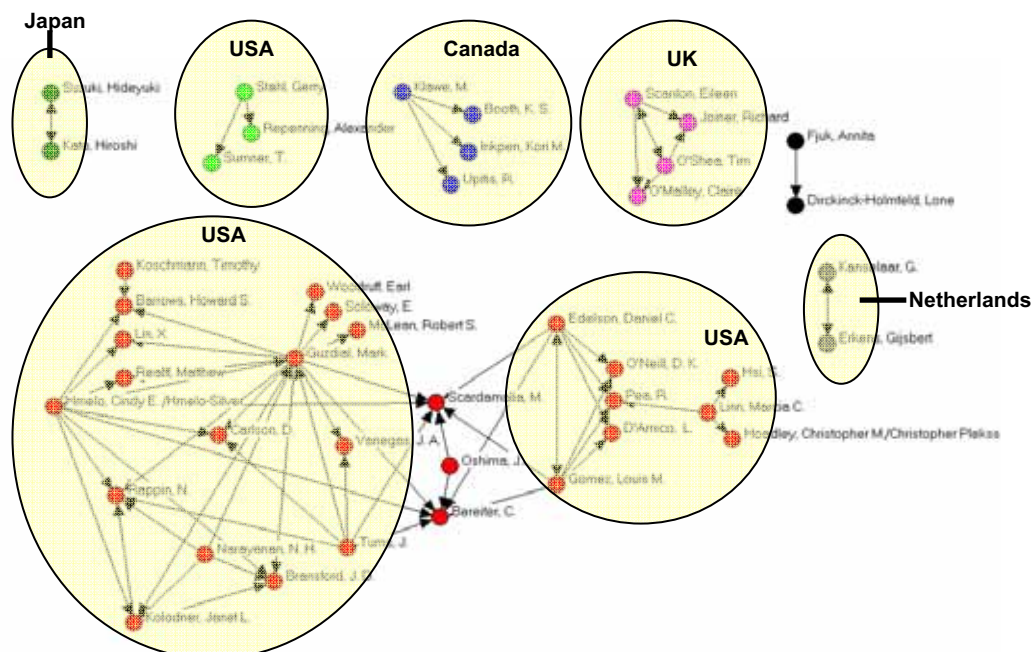


Figure 6: References in 1995



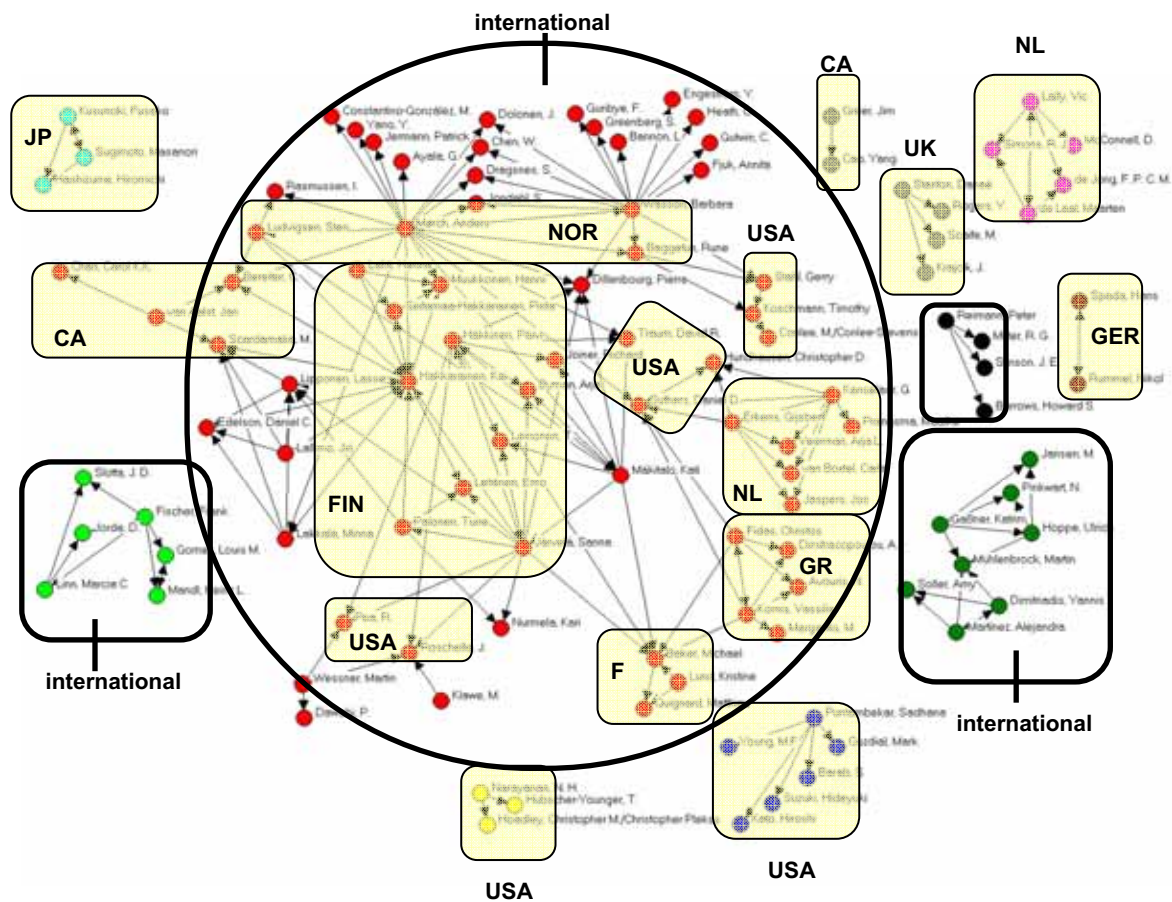


Figure 7: References in 2003

In a second step we try to verify this observation of growing international connection by analyzing the co-authorships which we rate as a stronger connection than references. Figure 8 compares the co-authorships of 1995 and 2003 on the abstraction level of countries concerning the papers (and co-authors) of the Top-88 authors. This data confirms the observation of growing international connection above. Here – as well as in the case of references – not only the number of nodes increases but also the international connectivity grows.

For 2003 we emphasize the close connection between authors from UK and Denmark (9+8 co-authorships) as well as from USA and Germany (8+8 co-authorships). A further interesting point is the large, national number of Finish co-authorships (61). This indicates a close meshed network with less connection to other countries though the view on the references (figure 6) suggests that finish authors are well positioned in the international (weaker) network of references.

To sum up, these findings support the assumption that the connectivity over regional boundaries grew over the last 10 years.

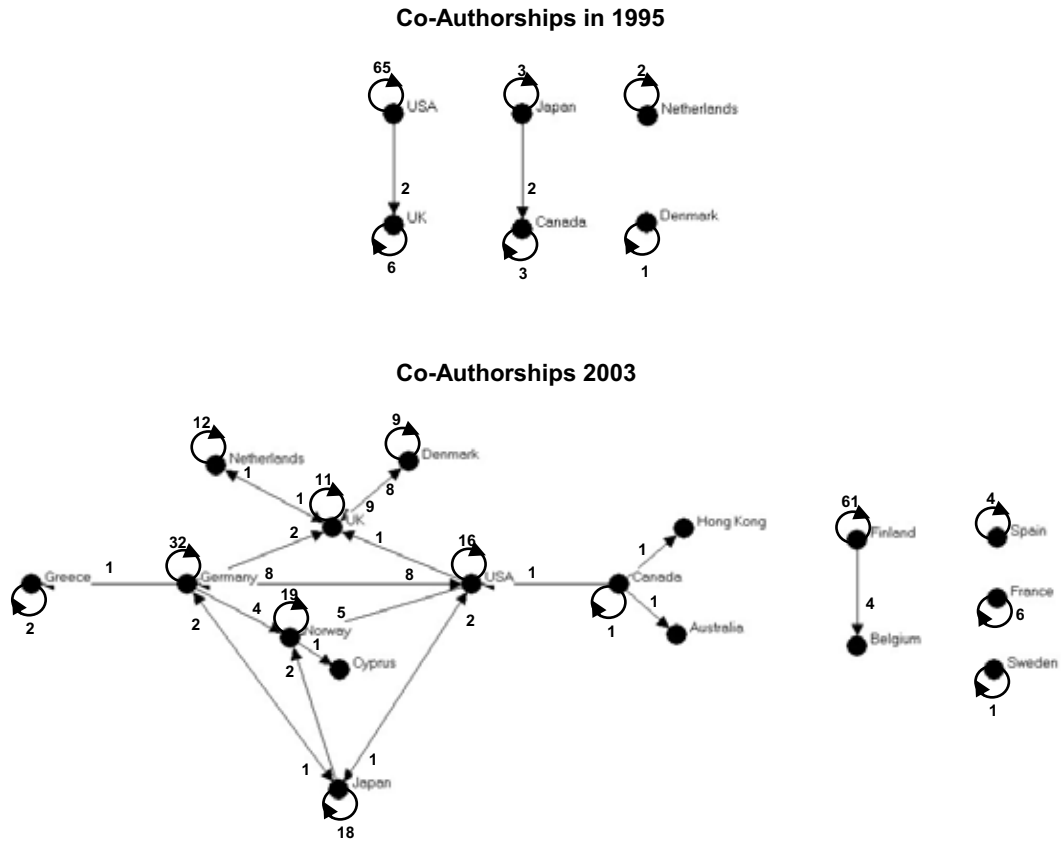


Figure 8: Co-authorships in 1995 and 2003

## CONCLUSIONS & FUTURE WORK

In this paper we presented an analysis of the CSCL community concerning its development and continuity as well as the connectivity. This analysis is based on a mix of several approaches: we performed a citation and co-authorship analysis of CSCL conference proceedings and analyzed other sources including lists of participants and lists of program committee members. Most data confirm that the CSCL community is a lively and growing community with a small core group of recurring authors and PC members. In detail we showed that the group of authors (as active members of the community) grew and the group size of the PC members stabilized.

Furthermore the data revealed that the international distribution of the community members grows. This is caused by the rotation of meeting locations and the international composition of the PC members. The relation to the different meeting places is given because we were able to show that new people who live nearby the conference location entered the community and a substantial percentage of them also participated in a following conference. The relation to the group of PC members is derived from a comparison to a citation analysis concerning the International Conference of the Learning Sciences (ICLS) (Kirby et al., in press). It showed the same relation between PC members and internationality in a different direction: a program committee with members from one country only corresponds with a low degree of internationality in the group of authors. The community, especially the members in the core of the community should be aware of the data presented here as a basis for decisions about meeting locations, composition of program and other committees etc. In addition the data could provide help to predict future characteristics of the CSCL community, for example participation numbers for upcoming conferences. To sum up, for further development of the CSCL community we recommend that the internationality in the program committee as well as the rotation of meeting locations should be maintained.

The international connectivity of the community is also increasing which can be seen in a growing number of citations and co-authorships across different countries. In order to support the international connectivity in the community authors should take opportunities to work with people from other regions and share the results in (co-authored) papers.



A problem might be seen in the relatively high share of participants, authors, and PC members who participate in or contribute to only one conference. The data showed that the quotient between new and recurring authors and PC members started to stabilize - for PC members 33% are newcomers, for authors 66 %. The part of recurring authors seems to be quite low. As authors and their products play a very important role in the development of the community, this should be increased. In order to increase the probability that people come back to later conferences, the core group might think about measurements to increase the identification of members with the community. Pragmatically, members could be asked via email or during a CSCL conference to discuss issues related to the continuous participation in the community.

The work reported in this paper aims at providing a basis for an ongoing analysis of the CSCL community and for the design of its future. Possible extensions include:

- Updating the data for each new CSCL conferences in order to provide current data on its development to the community.
- Recording also references and co-authorships of authors with only one or two participations in order to learn more about the less active authors and how they are distributed and connected in the community.
- Splitting up the artefacts in posters, short and full papers for a more fine-grained analysis of development, continuity and connectivity of the community. (It could make sense to include also submissions which have been rejected, e.g. because of space limitations in the conference program.)
- Further specifying citations, e.g. in order to identify the publication types, series or even individual publications which are most influential to the community.
- Including information about disciplines of participants, authors and PC members in order to analyze the multi-/interdisciplinarity of the community.
- Performing a social network analysis in order to identify for example subgroups and cliques. Following more elaborated analysis methods (e.g., Chen & Carr, 1999), major research fronts and the evolution of ideas, research topics or methodologies in the community can be identified.

The approach taken here, a combination of citation and co-authorship analysis and the analysis of other sources such as lists of participants, authors and PC members should also be applicable to other scientific communities.

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