Study of the visualization method about the learning situation from the perspective of learning analytics

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The background of research

Learning analytics

Development of data processing techniques provides support of techniques and methods for processing data.

Visualization study in-depth provides the reference model for visual representation of the results of the learning analytical data processing.

Visual presentation of learning analytical results provides a clear and objective basis for educators adjusting teaching strategies and carrying out the prediction mechanism quickly.

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Learning Interactive Analysis

Typical abroad research

A. Martinez integrated use of quantitative analysis, qualitative analysis and social network analysis, introduced the interaction between group members, analyzed the influence of members in the network structure interaction.

Interactive network analysis method allows results of analysis more objective, and the conclusions have strong explanatory.

Typical domestic research

"Social Network Analysis Introduction" , which is Liu Jun composed. He systematically introduced the history, specific methods, analysis types of social interaction network analysis and the analysis examples in a variety of disciplines, etc.

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Research

Innovations

By visual analysis, it were studied that exchange situation of the class online and offline and the impact of learning performance .

Research

The article conducted a visual presentation for analyzes student interaction network structure, centrality, cohesion, opinion leaders and so on. From several aspects above, teacher also discussed the overall structure of the class learning interactive, collaborative intra-group interaction and group collaboration specific circumstances, and how the interaction have effect on the individual and group performance.

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Object Analysis

- The subjects come from the major of educational technology, which has 43 people, and all of them are sophomore. The student had studied "Computer Basics" course when they were freshmen, they had a better understanding on computer operation, and no barriers on network exchange.

- They are getting along well with each other after a year's live and study, so they know each other, and have no intimacy disorder in their communication and interaction.

- This class is complete independent community; they have the same goals on learning, all above have well for the division of community boundaries and the collection and analysis of data.

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Package Design

First week (Analyze courses designed)	Teachers open microblogging group to communicate, upload the data of this lesson to the network platform , team members upload their work, and share it with other team
Second and third week (Teaching process and evaluate design)	In class, each group respectively has a report of their own design and progress, then teachers and other groups conducted reviews on it.
Fourth week (Implement teaching evaluation)	Scored by rating scale, modified according to class discussions and comment, and then submitted for final evaluation of teachers.

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Research Methods

- This study mainly used the way of social network analysis, which is based on data mining we can put information visually represented by software analysis. Using SNA to model social relationships and find social relationships within the group actors. Analysis of data and information which is flowing between actors, and analyze the relationships inside the group.

- After class, we combined interviews and surveys and combined qualitative with quantitative ways to make the analysis results more comprehensive and accurately.

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Data processing

We deal with the matrix of N*N for binaryzation and will the weight into 0 sand 1 in the analysis of some characteristics. Then put them into the UCINET software to produce the data of the network density of community graph, in degree, out degree, centrality, and small group and so on.

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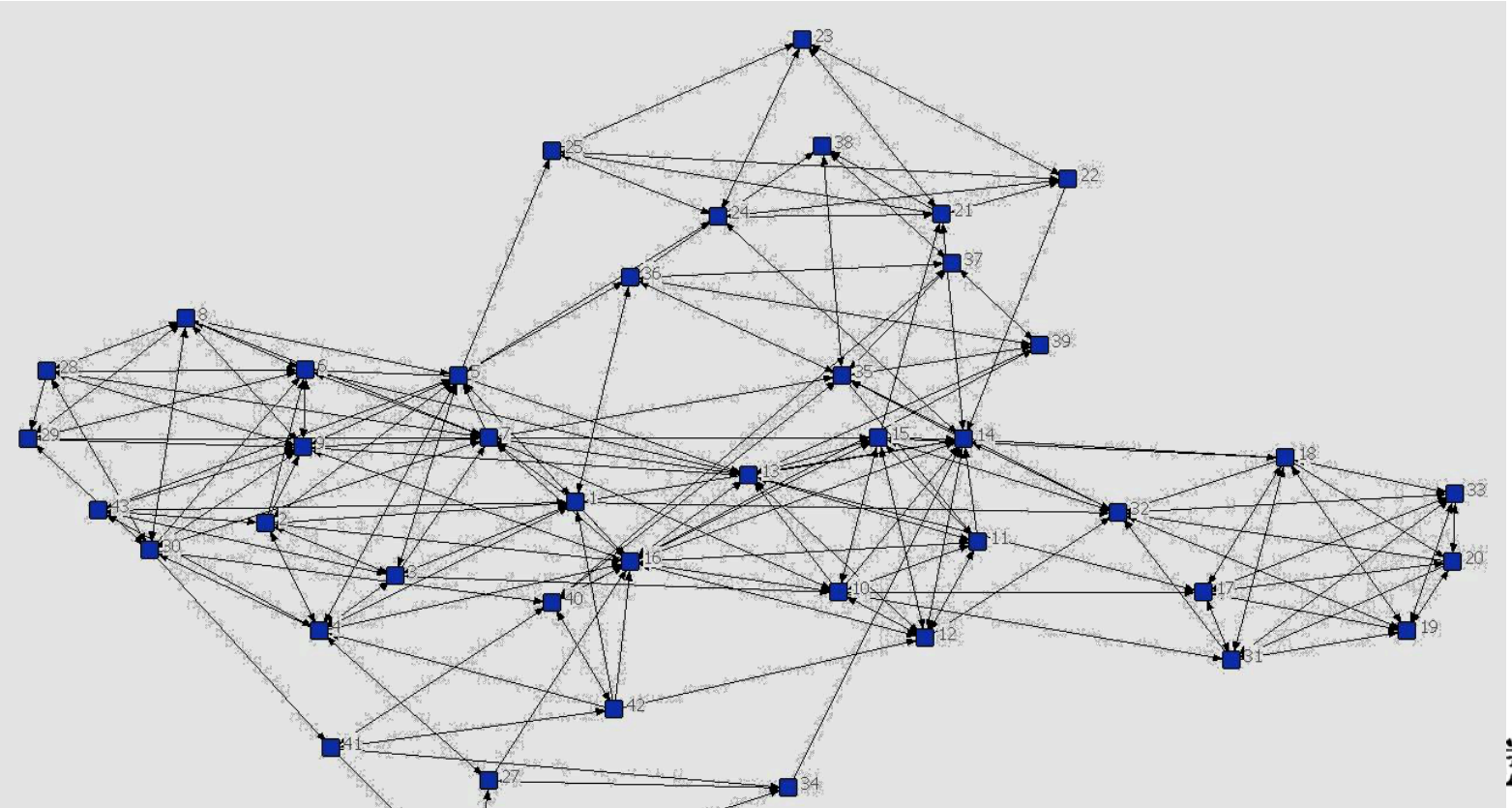
Data analysis——Network relationship analysis of community graph



Each node in the figure represents every member of the community, and the each line represents the interaction relationship between them.

- We can see unevenness network density in the class, some students interact frequently with classmates, who communicate frequently with in multimedia production and curriculum design and show strong problem solving skills and expertise overall quality. They help other students in the group or other groups to solve technical or professional theory and convenient problem, and their sharing and posting get a lot of attention of other students in the group. As opinion leaders, they affect the interaction of the entire community, for the center position in the interactive group, such as students NO.5, 6, 9, 14,15,33,35.

- Some students are in the community edge, with less connection points in the graph, they rarely communicate with other members, or only interact with a fixed number of people with very little contraction with the rest of the class ,little sharing and posting and little contribution to the whole community interaction, such as students NO. 22、23、26、27、34、41.

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Data analysis——The whole community center degree analysis – matrix method

From figure, you can see different community members to show different out degree and in degree

NO.	Out Degree	In Degree	Centrality	NO.	Out Degree	In Degree	Centrality
33	6	6	12	7	2	2	4
5	7	3	10	6	1	3	4
19	4	5	9	31	0	4	4
24	4	5	9	8	2	1	3
13	5	3	8	4	1	2	3
20	5	3	8	16	1	2	3
38	4	3	7	21	0	3	3
10	6	0	6	9	0		3
17	5	1	6	15	0	3	3
22	4	2	6	18	2	0	2
23	2	4	6	1	1	1	2
35	2	4	6	29	1	1	2

- The number of 23,35,32,27, 31,9,15 members have large in degree than out degree that indicate other students show interested in actively communicating with them；
- Some students have larger out degree than in degree, such as the number 13, 20, 10, 17, 22, they focus on other classmates more often ,discuss with other classmates to complete assignments and tasks of theory of technical knowledge, are generally team leader or the class cadre, who play a coordinating role in class；
- Members of the centrality degree (number 33,5,19,24,13,20) have more connection relationship, they interact more with other members, and they

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Relationship between centrality ,activity and members‘ performance ,work completed and achievement

SNO.	SA	SNO.	SA	SNO.	SA
1	84	16	79	31	78
2	83	17	85	32	86
3	80	18	86	33	81
4	88	19	87	34	74
5	85	20	77	35	76
6	86	21	83	36	79
7	91	22	81	37	83
8	85	23	80	38	81
9	89	24	85	39	83
10	83	25	73	40	86
11	81	26	77	41	88
12	85	27	86	42	81
13	88	28	75	43	84
14	81	29	85		
15	87	30	83		

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interactive community, have the larger out degree and in

etc. At the same time their

usually 85 points or more.

Some students' performance are relatively low, usually below 80, whose out degree and in degree are smaller, such as 26, 38, 34, 25, 23.

Students who act actively have more interaction, treat the task of this class more seriously, finish the homework with higher quality ,produce high individual performance ,and have more satisfaction in the classroom

The others at the edge location of the interaction structure don't adapt to the classroom, who have difficulty in finishing homework.

Students who act actively have

Data analysis—Analysis of Condensing Subgroup

Subgroup index in the range of [-1, +1], from the figure, the condensing subgroup density is quite obvious, it has reached -0.409. It explains that the interaction of the classes tends to interact with small groups inside, that is the members between various subgroups of the interior have relatively close relationship. That means learning interactions in the class is not universal interactive in class member, most of the interacting were going in internal groups, and they have less

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Whole Network Results

		1 Freq	2 Pct	3 Possible	4 Density
1	Internal	248.000	0.756	1272.000	0.195
2	External	80.000	0.244	534.000	0.150
3	E-I	-168.000	-0.512	-738.000	-0.409

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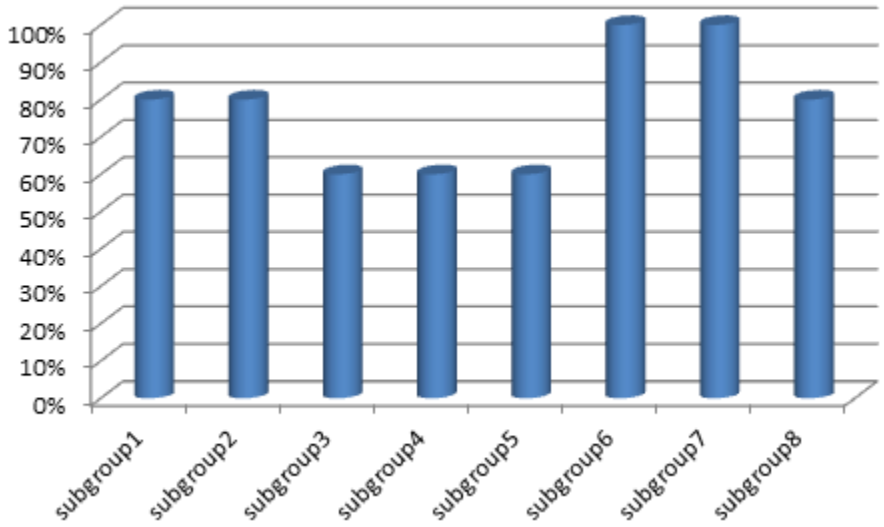
Data analysis— Small group analysis

The relationship between small groups and academic achievement



group number	group member	performance score	Group total score
G1	1、2、3、4、5、43	87	87
G2	6、7、8、9、28、29	95	89
G3	10、11、12、13、14、15、16	88	86
G4	17、18、19、20、21、22	80	79
G5	23、24、25、26、27、30	89	86
G6	31、32、33、34、35、36	82	83
G7	37、38、39、40、41、42	83	75

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- Internal study group did not constitute interact in small groups, and members of the group did not constitute interact in small groups with other team members either. It will be a greater impact on usually score and the total score for the group. Such as the 4th and 7th group.
- Groups which can match to reach 100% of the team members and small group, is basically the interaction within the group. As the first and the third group, not only the usually score but also the final total are high score. Both in the completion of the task team or personal tasks, they have more interaction in their group. The group members can help each other

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Data analysis—Analysis of the overall community network density community

The density of 0.1467 is far less than the standard 0.3538, so we can say that the relationship of each member of the whole network is not tight enough. From the analysis of the relationship between degree of personal interaction, degree of group interaction and achievement of all the class, overall interaction between the class is poor, which do harm to the achievement and should be taken attention by the teachers.

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Relation: 1

Density (matrix average) = 0.1467
Standard deviation = 0.3538
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Advantages

- Learning data mining and learning data analyzing, provide a scientific basis on the adoption of teaching strategies and adjusting for prediction mechanism.

- Sample of social network analysis study is so small and we can be fine-grained and accurate analysis for research that the results are targeted and have highly visualization.

Limitations

- This paper describes a method of visual learning analysis by the case study. More about visualization learn analysis needs further study.

- And the content of this study is the overall situation for the whole class interaction. As for the specific number of interactive and content not clearly show, I hope that later researchers can give further improve and perfect it.

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Thanks!

perspective of learning analytics