Effectiveness of group decision support systems (GDSS) in learning environments

Zachary Kelly| Dr. Donna McAlister-Kizzier mentor | College of Business and Technology

Purpose

In order to sustain competitive edge, organizations and students in the United States require strong critical and creative thinking ability.

This research will investigate the effect of group decision support system features on critical and creative thinking in undergraduate and graduate environments.

Methods

- Surveys after an applied activity in multiple volunteer (convenience) Morehead state business core classes (IRB clearance achieved)
- Exploratory Phase I piece of a larger study
- Two treatments using similar tools
  - GDSS using Facilitate Pro n=16
  - Blackboard polling features n=11

Research Questions

1. To what extent, if any, do the decision-enhancing features of GDSS systems (specifically anonymity, concurrent engagement, diversity equalization, increased engagement in less time, and analytics) affect the quality of outcomes as measured via critical/creative thinking activities. The following six learning quality factor were assessed: (1) solution quality, (2) solution creativity, (3) quality of contributions from participants, (4) honest input from participants, (5) consideration of all ideas, and (6) productive use of time for solutions.
2. What insight can be gained to enhance critical/creative thinking in collegiate and organizational education from the results of the analysis of the study results?

Recommendations

- Future Research
- Extend study to assess the effect of additional variables such as (1) academic discipline (quantitative-based such as finance, economics, accounting, science, math, etc. vs. qualitative based disciplines such as management, organizational behavior, management information systems, writing, behavioral, sociology, education, etc.), (2) class level (lower division undergraduate, upper division undergraduate, graduate, organizational training) and/or (3) delivery mode (courseware, hybrid, face to face)
- Expand the data set via additional research
- Educators and Practitioners
- For high-level critical and creative thinking activities in classrooms, such as case discussions, service-learning projects, and application projects, consider incorporating GDSS systems into class and team-based activities. This research indicates that doing so will achieve significantly higher solution quality and creativity as well as more inclusion in idea generation than standard technological or more traditional tools.

Results

Learning Quality Factor #1
Solution Quality

CrossTabs –Solution Quality

	Lowest Quality Solution 1.00	2.00	3.00	4.00	Highest Quality Solution 5.00	Total	Standard Deviation
							0.6399
With GDSS	0 (%)	6(54.54%)	0 (%)	6(54.54%)	0 (%)	6(54.54%)	
							1.0787
With Blackboard	1(6.25%)	2(18.18%)	1(6.25%)	2(18.18%)	1(6.25%)	2(18.18%)	

ANOVA- Solution Quality (sig. = 0.05)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	17.093	1	17.093	24.316	.000
Within Groups	17.574	25	.703		
Total	34.667	26			

Learning Quality Factor #2
Solution Creativity

CrossTabs –Solution Creativity

	Lowest Creative Viable Solution 1.00	2.00	3.00	4.00	Most Creative Viable Solution 5.00	Total	Standard Deviation
With GDSS	0 (0%)	0(0%)	1(6.25%)	10(62.5%)	5(31.25%)	16	0.5936
With Blackboard	0(0%)	3(27.27%)	5(45.45%)	2(18.18%)	1(9.1%)	11	0.9439

ANOVA- Solution Creativity (sig. = 0.05)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.519	1	6.519	5.093	.033
Within Groups	32.000	25	1.280		
Total	38.519	26			

Learning Quality Factor #3
Quality of Contributions from Participants

CrossTabs- Quality of Contributions from Participants

	Low-Level Contributions 1.00	2.00	3.00	4.00	High-Level Contributions 5.00	Total	Standard Deviation
With GDSS	0 (0%)	1(6.25%)	5(31.25%)	3(18.75%)	7(43.75%)	16	1.0328
With Blackboard	1(9.1%)	3(27.27%)	4(36.36%)	1(9.1%)	2(18.18%)	11	1.2649

Anova- Quality of Contributions from Participants(sig. = 0.05)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.556	1	1.556	2.127	.157
Within Groups	18.295	25	.732		
Total	19.852	26			

Learning Quality Factor #4
Honest input from Participants

CrossTabs- Honest input from Participants

	Not Honest Input 1.00	2.00	3.00	4.00	Very Honest Input 5.00	Total	Standard Deviation
With GDSS	0 (0%)	0(0%)	3(18.75%)	8(50%)	5(31.25%)	16	0.6761
With Blackboard	0(0%)	1(9.1%)	5(45.45%)	3(18.18%)	3(27.27%)	11	1.0269

ANOVA- Honest input from Participants(sig. = 0.05)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.002	1	1.002	1.156	.293
Within Groups	21.665	25	.867		
Total	22.667	26			

Learning Quality Factor #5
Consideration of all Ideas

CrossTabs- Consideration of all Ideas

	No Inclusive of Ideas 1.00	2.00	3.00	4.00	Highly Inclusive of Ideas 5.00	Total	Standard Deviation
With GDSS	0 (0%)	0(0%)	6(37.5%)	5(31.25%)	5(31.25%)	16	0.8452
With Blackboard	0(0%)	2(18.18%)	3(27.27%)	4(36.36%)	2(18.18%)	11	1.0357

ANOVA- Consideration of all Ideas (sig. = 0.05)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.758	1	8.758	15.741	.001
Within Groups	13.909	25	.556		
Total	22.667	26			

Learning Quality Factor #6
Productive use of time for Solutions

CrossTabs- Productive use of time for Solutions

	Not a Productive use of Time 1.00	2.00	3.00	4.00	Very Productive use of Time 5.00	Total	Standard Deviation
With GDSS	0(0%)	0(0%)	2(12.5%)	2(12.5%)	12(75%)	16	0.7237
With Blackboard	0(0%)	4(36.36%)	2(18.18%)	3(27.27%)	2(18.18%)	11	1.1909

Anova- Productive use of time for Solutions (sig. = 0.05)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.775	2	1.387	1.072	.358
Within Groups	31.077	24	1.295		
Total	33.852	26			

Individual Conclusions

- ANOVA indicated a significant difference in solution quality between GDSS and Blackboard with quality higher in the GDSS treatment (.000)
- ANOVA indicated a significant difference in solution creativity between GDSS and Blackboard with quality higher in the GDSS treatment (.033)
- ANOVA indicated no significant difference in the Quality of Contributions from Participants between GDSS and Blackboard with quality higher in the GDSS treatment (.157)
- ANOVA indicated no significant difference in Honest Input from Participants between GDSS and Blackboard with quality higher in the GDSS treatment (.293)
- ANOVA indicated a significant difference in Consideration of all Ideas between GDSS and Blackboard with quality higher in the GDSS treatment (.001)
- ANOVA indicated no significant difference in Productive Use of Time for Solutions between GDSS and Blackboard with quality higher in the GDSS treatment (.358)

Conclusion

- The results indicated that decision-enhancing features of group decision support systems (GDSS) (specifically anonymity, concurrent engagement, diversity equalization, increased engagement in less time, and analytics) significantly effect the quality of the following three learning factor outcomes as measured by critical/creative learning activities: (1) solution quality, (2) solution creativity, and (5) consideration of all ideas.
- ANOVA indicated a significant difference in three of the six learning factors based on discussion mode (GDSS vs Blackboard) studied: (1) solution quality (.000), (2) solution creativity (.033), and (5) consideration of all ideas (.001). In each case significantly higher quality was achieved in the GDSS discussion mode.
- Significant difference was not found between discussion modes (GDSS vs Blackboard) for the following learning factors: (3) Quality of Contributions from Participants (.157), (4) Honest input from Participants (.293), and (6) Productive use of time for Solutions (.358).
- Results are highly consistent with findings in GDSS business effectiveness studies in which quality of solution is significantly enhanced when GDSS is applied. When this research is applied in learning environments, as in business GDSS study results, the quality and of the outcome, that is the solution, is significantly enhanced. In addition, creative quality of the solution increases as does the ability to effectively consider all ideas from participants. This is in concert with findings in business studies. Thus significance was discovered in all process and output quality factors in the learning environment. However, significance was not discerned in the quality of input, which in all cases, lies not in the group structure but rather in individual learners. Since GDSS is by its very nature and technological structure designed to enhance group decision making, this is a logical result.