A DESIGN CASE OF SCAFFOLDING HYBRID/ONLINE STUDENT-CENTERED LEARNING WITH MULTIMEDIA

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ABSTRACT

Implementing student-centered learning in hybrid/online settings is very challenging due to the physical separation of instructor and students. This article discusses the need for instructors to provide scaffolds and multimedia modules to facilitate knowledge construction in the student-centered learning process. To offer students solid learning supports, four types of scaffolds and multimedia modules were used in one hybrid and four online business course sessions. The design context and pattern of those scaffolds and modules are described in detail. At the end of each course session, a survey was used to investigate student perceptions of the scaffolds and multimedia modules. The survey results showed that the scaffolds and multimedia modules used were helpful to student-centered learning but that additional guidance might be needed to meet the needs of diverse learners and facilitate the group-work process.

Keywords: Multimedia, Scaffolds, Student-Centered Learning, Hybrid and Online Learning

INTRODUCTION

Student-centered learning is based on constructivism. Constructivists believe that students have to construct their own knowledge from the learned experiences. This approach has been promoted by many researchers due to its capability to increase students' motivation, to strengthen students' confidence, and to stimulate their intellectual development (Din & Wheatley, 2007; Smit, de Brabander, & Martens, 2014). Student-centered learning emphasizes the active role of students and their ownership of learning, which increases the opportunities for developing critical thinking and problem-solving skills (Brush & Saye, 2002; Savery & Duffy, 1995). This approach allows students to construct knowledge by gathering, synthesizing, and integrating information and often they work as a group to do this (Huba & Freed, 2000).

Although this approach has a number of advantages, implementing it in hybrid or online environments is challenging due to the physical distance between instructors and students. In hybrid or online environments, students do not usually meet their instructors face-to-face on a regular basis to ask questions or clarify misconceptions. Therefore, these students definitely need from their instructors more supports for learning engagement. If they do not receive these supports from instructors while working on their own, it is likely they will become easily frustrated and choose to discontinue their learning (Croxton, 2014).

To offer solid learning supports to students, a strategy called "scaffolding" was suggested by Lev Vygotsky (1978). The scaffolding strategy, which originated from Vygotsky's "zone of proximal development," indicates that with proper supports a student can achieve what he or she cannot achieve on his or her own. Thus, using appropriate scaffolding strategies, such as offering constructive feedback, clear guides, and useful instructional resources, would help students achieve more in the learning process (Thomas & Sondergeld, 2015). Hill and Hannifin (2001) have proposed four types of

scaffolds to support learning: conceptual scaffolds, procedural scaffolds, strategic scaffolds, and metacognitive scaffolds. First, conceptual scaffolds help students focus on learning, prioritize learning concepts, make connections between concepts, and simplify complex concepts. Providing an outline or a blueprint of learning concepts would help supply this type of scaffold. Second, procedural scaffolds can help students utilize learning resources. To provide procedural scaffolds, instructors can offer a clear navigation guide or step-by-step instructions for a given learning process. Third, using strategic scaffolds, instructors can provide explicit or inexplicit strategies to students in order to maximize learning outcomes. To provide this type of scaffold, instructors can include advice from content experts when designing the course activities. Lastly, metacognitive scaffolds can assist students in reflecting on their learning goals and process. This can be achieved by proposing challenging questions or asking students to write reflective journals. Furthermore, Brush and Saye (2002) suggested that instructors offer hard and soft scaffolds to enhance student learning. Instructors can build hard scaffolds into multimedia or hypermedia software to help prevent typical learning difficulties associated with course tasks. A well-design multimedia instruction helps students construct and process their knowledge more effectively in hybrid or online settings (Beard, Wilson, & McCarter, 2007; Brush & Saye, 2002; Hsiao & Mikolaj, 2013; Mayer, 1997; Mayer & Moreno, 2002). In addition, instructors can provide soft scaffolds through continuous observation and diagnosis of students' learning by giving constructive feedback (Brush & Saye, 2002).

THE DESIGN CONTEXT, PATTERN, AND PRODUCT

Design Context

The design case was implemented in two business courses at a medium-sized mid-western university in 4 semesters (including 1 hybrid course session and 4 online course sessions). The course management system was Blackboard. In these courses sessions, students were required to complete a semester-long group project to solve complex real-world problems of chosen businesses or nonprofit organizations. Students had to select a project organization first and then investigate its existing business problems. After the investigation, they had to write up a plan to solve any problems they found. During the entire problem-solving process, students needed to work closely with their peers to develop, evaluate, and recommend possible solutions and to complete reports for both written and oral group project. Their written reports were evaluated by both the instructor and an invited industry consultant for expert evaluation. The group projects took all semester and required many learning efforts. Based on the instructor's observation from previous semesters, students did need more help from the instructor in order to produce group projects with better quality and to overcome problems encountered in the group work process.

The intent of the semester-long group project was to simulate the actual working environments that graduates of the program would encounter when they started their entry-level positions or they completed the risk management program. A group of industry consultants suggested that projects should incorporate a group approach and that each group involve individuals from various complementary specialties, particularly for midrange to large organizations. At the same time, the program curriculum incorporated a new industry concept of enterprise (business) risk to reflect a more holistic and realistic perspective on risk faced by all organizations. Also, because the online courses of the program were offered asynchronously, students were not required to be regularly present at any one time for "lecture." The dynamics of group interaction, which was realized by having group members spend time together online, were occasionally achieved more by luck than by design. Finally, because many students in the program were geographically scattered across the country and/or were employed full time, the instructor felt that providing realistic examples from working professionals could bridge the logistical time and distance divide. Thus, four key elements (actuarial study, business risk, teamwork, and property loss control initiatives) were incorporated into the multimedia modules using Lectora, an e-learning software, to support the group projects. These four elements are needed for project development in these courses. To emphasize the importance of the group experiences, these projects constituted two thirds to three fourths of the students' course grade. These four modules provided students with

a sufficient complexity of multidimensional risk interaction and real-world experiences.

Design Pattern

The instructional resources in each multimedia module can be divided into three main categories: interview videos, academic literature (articles), and business literature (articles). Three or four consultants from different industries were invited for face-to-face interviews to share their experiences in solving issues and problems related to each module. The interviews were recorded and edited into smaller videos. These videos were offered under the category of interview videos. The academic literature was related to the theoretical foundations of each module. Relevant examples that occurred in the field were provided in business literature. In addition, hard scaffolds were embedded in each multimedia module and soft scaffolds were offered by the instructor throughout each semester. Every module followed the same design pattern for instructional design including four types of scaffolds:

1. Conceptual scaffolds
   a. One introductory audio file was offered to help students conceptualize an outline of associated learning concepts covered in each category of instructional resources.
   b. Another introductory audio file was provided to explain the conceptual framework of the real-world scenario included in each interview video.
   c. Three or four interview videos plus relevant academic and business articles were offered to help students get acquainted with the module content.
2. Procedural scaffolds
   a. One brief audio file was included to help students understand how to utilize the instructional resources within each module.
   b. Simple versions of the user guide and navigation aids were offered and shown in pop-up windows to help students navigate the module.
3. Strategic scaffolds
   a. Three or four interview videos were provided to help students connect their group projects to real-world scenarios. The real-world scenarios focused on how the invited consultants handled relevant issues or problems that happened in their own industries.
   b. An instructor's discussion of extended concepts was included in an audio or a video format to help students achieve a deeper understanding of the module content.
   c. Academic articles were incorporated to help students establish a solid theoretical foundation for their group projects.
   d. Business articles were offered to show students current examples in the field to help them understand what happens in the outside world.
   e. Consultants were invited to join in course conversations with students through online discussion boards and Adobe Connect to provide professional advice to them. Students also contacted them via e-mail if they had any additional questions.
4. Metacognitive scaffolds
   a. In the instructor's discussion of the extended concepts, follow-up questions were provided to assist students in reflecting on their own learning about the module content how it relates to their group projects.
   b. A reflection exercise was incorporated at the end of each module to help students think more deeply about the module content. Students were required to write a short reflection paper on their learning experiences.
   c. The instructor constantly encouraged students to interact with their peers to share experiences and knowledge throughout the group process via multiple communication channels (e.g., e-mail, chat room, file exchange, wiki, discussion boards, and Adobe Connect).

Design Product: Business Risk Sample Module

This design case used the Business Risk module as the sample module. The traditional approach to managing risks and security in organizations has been to treat individual risks separately, assigning

dedicated individuals or teams to each risk within different departments. Risk management focused on property, liability, and personnel risks. In the 1990s, some organizations began to expand their risk management programs to include speculative financial risks which, in turn, led to interest in considering the strategic implications of all the risks to an organization. This holistic view has evolved into a comprehensive approach to managing risk called Enterprise Risk Management (ERM), where pure and speculative risks are combined with considerations of an organization's goals and objectives, together with an evaluation of the organization's strengths, weaknesses, opportunities, and threats. So long as the risks are not perfectly and positively correlated, the combination of loss exposures reduces risk.

Enterprise Risk Management is a new concept that had not been covered in the students' risk management program course of study. However, some of the course consultants were familiar with it and included certain components of ERM into their organizations. Also, the real-world aspect of student course projects necessitated introducing ERM, in a limited way, to the online courses. Therefore, it was decided to bridge this gap by introducing the term "business risk" into the course material. "Business risk" then came to mean one or more elements of an ERM Program. In this way, students would be introduced to ERM but not held to the rigorous requirements of establishing a fully functioning ERM Program.

Prior to this point, undergraduate risk management programs focused on teaching students the skills to manage operational or hazard risks where the ultimate result to an organization could be either a loss or no loss during a period of time. Enterprise risk had always been present in an organization; however, this risk was traditionally managed by the C-Suite (the senior executives of the organization). Given the complexity of ERM risk, entry-level professionals (students who graduate from risk management and insurance programs) would not have the maturity and/or the background to handle this situation. However, program faculty felt it was important to include some basic elements of enterprise risk into the courses so that students could gain some familiarity with the concept. In this design case, enterprise risk components were called "business risk." Business risk for these courses involved pursuing business opportunities (upside risk) to maximize or profit from these opportunities while at the same time controlling threats (downside risks) which could limit an organization's success or cause a financial loss. A good example of a business risk faced by an organization is: Should a company use social media to promote their products or services?

There were six main pages constructed for each multimedia module: 1) Front Page, 2) Table of Contents, 3) Interview Videos, 4) Academic Literature, 5) Business Literature, and 6) Reflection Exercise. The Business Risk module followed the same design pattern mentioned previously. First, the instructor provided a narration on the Front Page of the module to introduce the information covered within the module and explained how the instructional resources can be used. Second, on the Table of Contents page, one introductory audio file was provided by the instructor to explain the information covered in each category of instructional resources (interview videos, academic literature, and business literature).

Third, three interview videos were provided on the Interview Videos page. The instructor also offered an introduction to each interview video to give students a preview of each video. These invited consultants, who were from golf, manufacturing, and food industries, shared the potential business risks in their own industries. They provided real-world scenarios and useful suggestions about how they handled business risks. For example, consultant A's video covered scenarios about 1) business risk issues in golf industry, 2) Tiger Woods' effect-reputation risk, and 3) consultant A's involvement in business risks. Consultant B's video covered scenarios about 1) business risk examples at Snap-on, 2) marketing advantage, and 3) franchisee loss control. Consultant C's video covered scenarios about 1) business risk issues, 2) Smucker's peanut butter recall, and 3) managing reputation risk. The consultants' business cards were shown on the same page so students could contact them for more information if needed. On the same page was presented the instructor's discussion of the extended concepts in an audio format. It gave students the instructor's metathoughts and offered further discussion on the video content, which might help facilitate knowledge construction.

Fourth, on the Academic Literature page, three

articles were offered: 1) ERM: The new language of risk, 2) Enterprise Risk Management: An analytic approach, and 3) Teaching Enterprise Risk Management: A modeling approach. As shown in Figure 1, subtopics were listed to give students an idea of the overall structure of each academic article, and students were able to click on the document button to read the full text of each academic article.

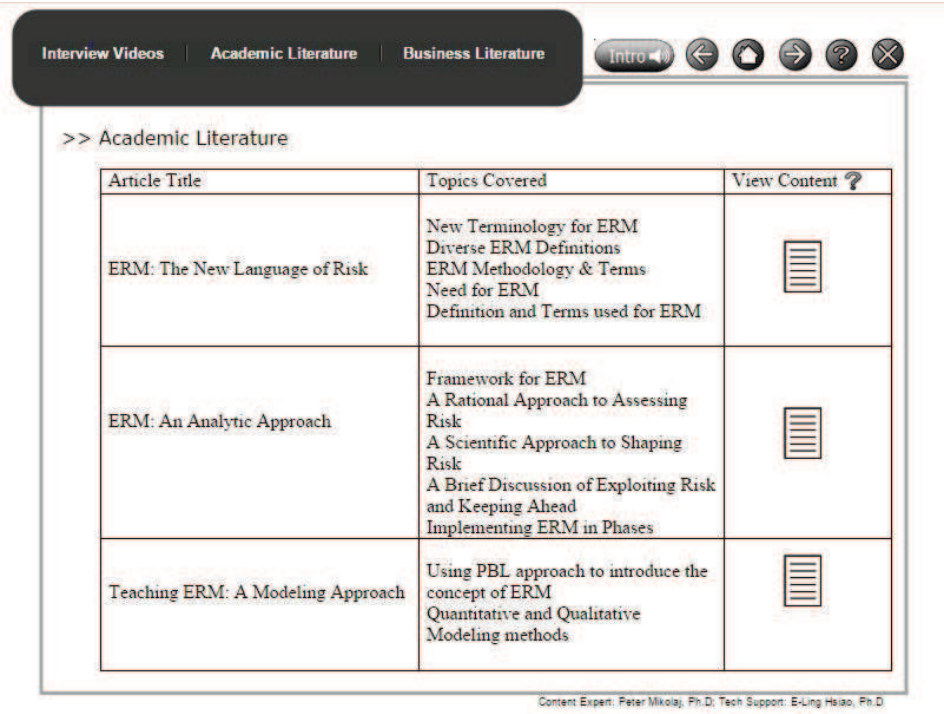

Figure 1. Screenshot of the Academic Literature page in the Business Risk module.

Fifth, on the Business Literature page, four articles were provided showing current examples in the field: 1) Businesses hone ERM plans: Survey, 2) Financial impact of golf felt all around with Tiger Woods gone, 3) Ford's bet: It's a small world after all, and 4) "Toyota Way" was lost on road to phenomenal worldwide growth. Again, subtopics were listed to give students an idea of the overall structure of each business article, and students were able to click on the document button to read the full text of each business article.

Lastly, after viewing the instructional resources, students were asked to complete a reflection exercise. They had to write a short paragraph answering the following questions: 1) Were the risk managers involved in identifying and solving business risks for their companies? 2) Could you tell the difference or make a distinction between the business risks and the hazard risks that were being discussed? 3) Can you apply what you learned from the Business Risk module to your group project? and 4) How well prepared do you think you are to participate in business risk analysis? Those questions helped students reflect on the module content and its relation to their group projects.

Except the aforementioned instructional resources, a simple version of the user guide was incorporated on the top menu. Navigation aids were also provided on each page to help students navigate the module and utilize resources. When students clicked on the question mark button, a Help screen appeared with the needed navigation information.

STUDENT PERCEPTION TOWARD THE SCAFFOLDS AND MULTIMEDIA MODULES

To investigate how students perceived the scaffolds and multimedia modules, a 31-item survey was distributed to students at the end of each course session. The main structure of the survey included four sections: 1) demographic information (e.g., prior knowledge) (Questions 1-3), 2) satisfaction with multimedia modules provided (Questions 4-11), 3) perception of scaffolding strategies used

in multimedia modules to assist student-centered learning (Questions 12- 29), and 4) suggestions for improving the scaffolding strategies used in multimedia modules (Questions 30–31). The purpose of the first three questions was to understand students' basic information, including gender, prior knowledge of insurance, and comfort levels using multimedia for online learning. Questions 4 to 11 were 5-point Likert items used to investigate student satisfaction with multimedia modules provided (1 = Very Dissatisfied, 2 = Dissatisfied, 3 = Neutral, 4 = Satisfied, and 5 = Very Satisfied). Questions 12 to 29 were also 5-point Likert items (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree) used to investigate student perceptions of different scaffolds used to support student-centered learning (e.g., conceptual scaffolds, procedural scaffolds, strategic scaffolds, metacognitive scaffolds, and overall scaffolding strategies). The last two questions were open-ended questions where students could provide their suggestions for improving the scaffolds and multimedia modules. The reliability of the survey was high, with Cronbach's alpha at .97.

A total of nine males and twelve females completed the survey. Five of them were from the hybrid session and sixteen of them were from the online sessions. Most of participants (71.4 %) had already taken more than 4 insurance courses before taking this course, which meant these students might possess higher knowledge of insurance. The survey data also indicated that most of the students (81 %) felt comfortable using multimedia for online learning.

Section 2 was about students' satisfaction with multimedia modules and it contained 8 questions (Questions 4 to 11). The average rating for questions in Section 2 was 3.92 (SD = .58). It meant that students tended to be satisfied with the scaffolds offered, including: 1) audio files, 2) interview videos, 3) instructor's discussion of the extended concepts, 4) academic articles, 5) business articles, 6) user guide, (7), module layout, and 8) reflection exercise. The highest rating was shown on their satisfaction with the interview videos (M = 4.10, SD = .70). A statement made by Student A could probably explain this result. According to student A, he or she was more satisfied with the use of interview videos to support learning as compared to academic or business articles. He or she said, "Academic articles and business articles were minimal in help compared to the interviews. The articles gave information, while the interviews helped to explain it and apply it to real-world scenarios." On the other hand, the lowest rating was found related to student satisfaction with the user guide (M = 3.76, SD = .77). It meant that the user guide design might need some improvements. The existing user guide was shown on pop-up windows with icons and minimal text-based information. For module revision, multiple formats (e.g., video-based format or interactive animation) or extra guidance can be added to fit the needs of diverse learners (e.g., visual learners or learners who need more support with module navigation and resource utilization) (Hsiao & Moore, 2008; van der Meij & van der Meij, 2015).

Section 3 was about students' perception of scaffolding strategies in multimedia modules to assist student-centered learning and it contained 18 questions (Questions 12 to 29). The average rating for questions in Section 3 was 4.01 (*SD* = .55). Questions in Section 3 were categorized into four types of scaffolds plus overall scaffolding strategies. Questions 12 to 14 were about student perception toward the helpfulness of conceptual scaffolds. The average rating for questions related to conceptual scaffolds was 4.14 (*SD* = .58), which was highest rating among all questions related to scaffolds. It meant that students agreed with the helpfulness of conceptual scaffolds to their learning. These included 1) the introductory audio files used for helping conceptualize an outline of the learning concepts covered in each category of instructional resources (Question 12), 2) the introductory audio files used for helping understand the conceptual structure of the real-world scenarios in each interview video (Question 13), and 3) the interview videos and academic/business articles used for helping get an overall idea of each module's content (Question 14).

Questions 15 to 16 related to students' perception of the helpfulness of procedural scaffolds. The average rating for questions related to procedural scaffolds was 3.88 (*SD* = .65), which was the lowest rating among questions related to scaffolds. Although students tended to agree with the value of procedural scaffolds (introductory audio file and user guide) for helping with resource utilization and module navigation, user guide

modifications would have to be made for future use. This result was consistent with the finding of students' satisfaction with the user guide.

Questions 17 to 22 related to students' perception of the helpfulness of strategic scaffolds. The average rating for questions in this category was 3.99 (SD = .64). It revealed that students tended to agree with the helpfulness of strategic scaffolds to learning including the use of interview videos (Question 17), solutions offered (Question 18), instructor's discussion of the extended concepts (Question 19), academic articles (Question 20), business articles (Question 21) and industry experts' presentations (Question 22). Students gave a higher rating on industry experts' presentations and thought their presentations help them better understand the big picture of business risk (M = 4.24, SD = .83). However, students had a lower rating on the helpfulness of instructor's discussion of the extended concepts to their learning (M = 3.76, SD = .89). The instructor's discussion of the extended concepts covered more complicated concepts and some students might have had problems comprehending them and needed extra guidance. This may be especially true for students who were not that involved in the group work process or students who had less relevant prior knowledge (Kalyuga, Chandler, Tuovinen, & Sweller, 2001). Thus, providing additional resources or giving instructor's notes was suggested to help students better understand the extended concepts.

Questions 23 to 26 related to students' perception of the helpfulness of metacognitive scaffolds (e.g., follow-up questions—Question 23; reflection exercises—Question 24 and Question 25; and instructor's encouragement—Question 26). The results indicated that most students did value the importance of metacognitive scaffolds and students agreed that using these metacognitive scaffolds (especially follow-up questions and reflection exercises) helped them reflect on their own learning experiences and think deeper about the module content (M = 4.01, SD = .59). The lowest rating was found on student perception of the instructor's encouragement on peer interaction during the group work process (M = 3.86, SD = .85). In these course sections, the instructor played his or her role more as a coach and encouraged students to learn from each other during the group work process and was more concerned with the group process than the individual's level of learning. Based on this result, we believe that the instructor needs to do more to support individual learning needs and facilitate peer interaction during the group work process in student-centered learning environments in order to make group work a more meaningful learning experience for students.

Questions 27 to 29 related to student perception of the helpfulness of overall scaffolding strategies. Students agreed with the helpfulness of overall scaffolding strategies to learning (M = 4.02, SD = .61). They reported that the overall scaffolding strategies used did 1) help them interpret relevant learning concepts needed in their real-world project (Question 27), 2) help them connect their course project with applicable real-world experiences (Question 28), and 3) support their learning in hybrid or online environments (Question 29). Student B shared a positive experience by reporting that "I think it is great and it gives me an opportunity to learn from real-world experiences." Student C also mentioned that "I liked how everything was. It was easy to understand and everything provided allowed me to get more of an understanding of the concepts being taught."

Table 1:

Descriptive Data for the Average Ratings Related to Student Satisfaction and Perception of Scaffolds Offered.

N	Section Name	Subcategories	Questions	M	SD
2	Satisfaction		Q. 4–Q. 11	3.92	.58
3	Perception		Q. 12–Q. 29	4.01	.55
		Conceptual Scaffolds	Q. 12–Q. 14	4.14	.58
		Procedural Scaffolds	Q. 15–Q. 16	3.88	.65
		Strategic Scaffolds	Q. 17–Q. 22	3.99	.64
		Metacognitive Scaffolds	Q. 23–Q. 26	4.01	.59
		Overall Scaffolding Strategies	Q. 27–Q. 29	4.02	.61

Except the above-mentioned findings, significant differences were found between students in the hybrid session and students in online sessions on their ratings to Question 8 (satisfaction with the business articles, $t(19) = 2.822$, $p = .011$), Question 16 (helpfulness of the user guide to module navigation, $t(19) = 2.507$, $p = .021$), and Question 21 (helpfulness of the business articles to provide current examples in the field, $t(19) = 2.691$, $p = .014$). Students in the hybrid session gave much higher ratings on these three questions as compared to students in the online sessions. It was difficult to conclude that the business articles and user guide helped students in the hybrid session more on their learning due to the small sample size in the study. In addition, participants from the hybrid course session had more prior knowledge of insurance because all of them have already taken more than four insurance courses before taking the current course. Thus, prior knowledge was also a factor that may affect how participants perceived the value of the business articles and the user guide to their learning and project development. A larger sample size is suggested for future studies to investigate this issue.

CONCLUSION

This article discussed the needs of offering scaffolds and multimedia modules to support student-centered learning in hybrid and online settings, and the authors detailed the context, pattern, and product of this design case. The collected survey data showed that most students felt satisfied with the scaffolds and multimedia modules and thought scaffolds and multimedia modules were helpful to their learning. In particular, they were more satisfied with the interview videos than the other categories of instructional resources. The interview videos contained the invited consultants' advice and experience of real-world scenarios that helped students connect their group projects to real-world settings. In addition, students agreed that conceptual and metacognitive scaffolds were more helpful for their learning than the procedural and strategic scaffolds. Based on the students' survey responses, some improvements need to be made in order to better support student-centered learning in hybrid and online settings. First, in revising modules, multiple formats (e.g., video-based format or interactive animation) and extra guidance can be added to meet the needs of diverse learners (e.g., visual learners or learners who need more support with module navigation and resource utilization). Second, when discussing complex concepts, extra guidance, such as additional resources or instructor's notes, should be provided to help students better comprehend the concepts. This will be helpful for students who are not that involved in the group work process or who have less prior knowledge. Third, instructors will have to use different strategies to support individual learning needs and facilitate peer interaction during the group work process in student-centered learning environments. This will make group work a more meaningful learning experience for students. Several strategies can be used such as 1) explaining the benefits of creating multidisciplinary groups, 2) helping students identify how effective groups work, 3) discussing the methods of effective group communication, and 4) requiring regular feedback throughout the semester from individual members to evaluate the group work process. Those strategies would help build the group concept and help students understand what is expected in the group process so they can properly interact with each other to optimize learning outcome from the group work process in student-centered learning environments.

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