

# PROVIDING AUTHENTIC WORKPLACE TEAM LEARNING IN ARCHITECTURE DESIGN STUDIOS

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## INTRODUCTION

Many design studios globally teach architectural design using the master-apprentice model. A studio leader assigns an open-ended project brief to students and guides them through a design process to resolve the brief and propose a design outcome. Unsurprisingly, many studio leaders implement groupwork to prepare students for the current collaborative nature of architectural projects found in professional practice. However, putting students in groups only offers them an opportunity to work together; it does not teach them how to collaborate as a team of designers. So how can student teams in architecture design studios facilitate positive teamwork while stimulating a professional environment that provides authentic workplace team learning processes?

This paper first reports briefly on team learning concepts found in architecture pedagogy, team learning concepts found in workplace learning, and critical tenets of student-centered learning. The purpose is not to provide a thorough review of team learning concepts, for researchers have already done so, but to synthesize team learning constructs from the two disciplines into an executable teamwork framework for students.<sup>1</sup> I then propose a student-centered learning framework for students to understand, apply, and evaluate their team learning processes in design pedagogy. The paper concludes with recommendations for students and design studio leaders on facilitating effective team processes in the design studio environment.

## TEAM LEARNING CONSTRUCTS

This section reviews briefly team learning literature in architecture pedagogy and workplace team learning literature in organizational learning.

### Team learning in architecture pedagogy literature

In 2012, Tucker and his colleagues conducted two-year-long research on team learning in architecture and related design learning contexts.<sup>2</sup> Through an extensive review of educational and design literature, they identified “what constitutes effective teamwork, what contributes to effectiveness in teams, what leads to positive design outcomes for teams, and what leads to effective learning in teams.”<sup>3</sup> From the review, they developed an Input-Process-Output (IPO) framework to measure team effectiveness in student design teams (refer to Figure 1).

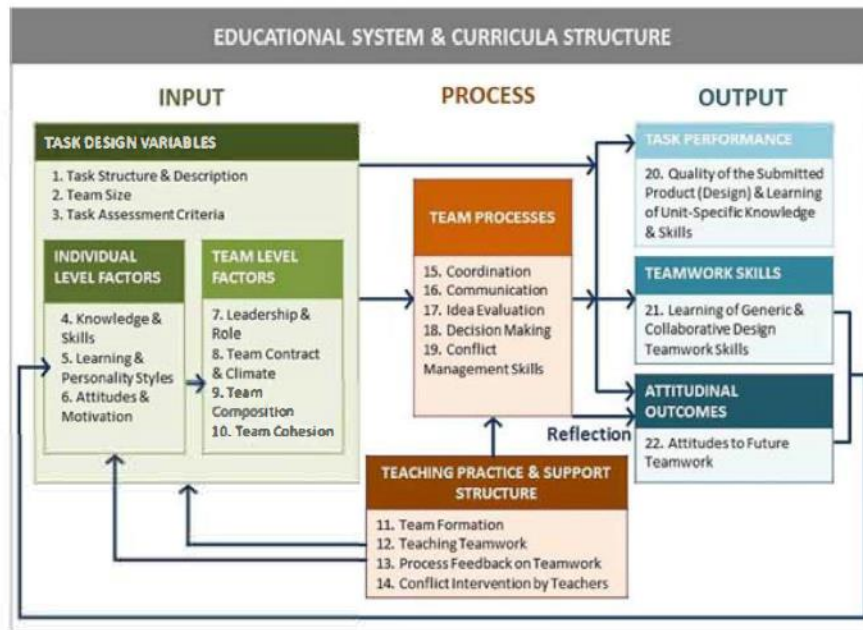


Figure 1. IPO framework of effectiveness in student design teams

Since this paper aims to develop a student-centered learning model for team learning in architecture pedagogy, constructs that impact the effectiveness of student teamwork but lie outside the students' control, such as *Task Structure & Description* and *Team formation* (as shown in Figure 1), are omitted from discussion. These omissions do not imply that those constructs are of lesser value but simply that the constructs are beyond the boundaries of where students perform teamwork. Outputs such as *Attitudes to Future Teamwork* were also omitted from discussions because they were used to assess teamwork effectiveness whereas this paper focuses on revealing the conditions and processes that students must address before and during design studios to enhance team learning. The remaining constructs that impact how the students learn from their team members are described below.

There are three individual-level constructs:

1. knowledge and skills,
2. learning and personality styles,<sup>4</sup> and
3. attitudes and motivation.<sup>5</sup>

A student's *knowledge and skills* may differ from their teammates, which impacts the level of team learning that can occur between students. A student's *learning style* influences their level of engagement with the rest of the team, whereas their *personality style* influences how they choose to communicate with their team. A student's *attitude and motivation*, commonly informed by previous teamwork experience, impacts their amount of drive to work in a group. Four team-level constructs implicate how students collaborate:

1. leadership and role,<sup>6</sup>
2. team climate,<sup>7</sup>
3. team composition,<sup>8</sup> and
4. team cohesion.<sup>9</sup>

*Leadership and roles* enable teams to set more explicit individual task goals, which may help students to collaborate more efficiently. A *team climate* that provides a psychologically safe environment for team members to share their opinions safely fosters greater team learning. A *team composition* of diverse individuals gives students more opportunities to learn from one another's differences. *Team*

*cohesion*, which is the bond that ‘glues’ team members together throughout their project, increases the number of encounters team members can learn from each other.

Aside from the seven constructs, there are an additional five constructs at the process level that influence student teamwork:

1. coordination,<sup>10</sup>
2. communication,<sup>11</sup>
3. idea evaluation,<sup>12</sup>
4. decision making,<sup>13</sup> and
5. conflict management.<sup>14</sup>

When team members *coordinate* their effort, they continuously learn from each other’s progress to ensure the project is developing on time. When they *communicate* verbally and visually, students learn from one another’s project progress and how communication can be carried out in different ways. When team members *evaluate their ideas* together, they learn different ways of generating and evaluating design ideas from one another. Similarly, when team members *make decisions* together, they know each other’s perspectives and different ways to assess their design project. Finally, *managing conflict* enables teams to maintain team cohesion and team climate, which ultimately increases opportunities to continue learning from one another.

### **Team learning in workplace learning literature**

Generally, team learning is the effort each member makes to create a team mental model and eventually build their team knowledge. Unlike the current research focus on design collaboration, which looks broadly at how designers transmit information, team learning examines how team members transmit, understand, refine, and retransmit information between one another.<sup>15</sup> There are three ways to comprehend team learning:<sup>16</sup>

1. A process about how team members learn from, evaluate, and change according to the feedback given by other team members,<sup>17</sup>
2. An outcome, which is the team’s knowledge produced when team members share their knowledge and experience,<sup>18</sup> and
3. The relationship between the process and outcome.

In this paper, I use Edmondson’s perspective to examine team learning as a process to compare with the processes identified in teamwork in architecture pedagogy. Team learning processes, also recognized as team learning behaviours (TLBs) in the organizational learning literature, consist predominantly of the following three behaviours:<sup>19</sup>

1. sharing,
2. co-construction, and
3. constructive conflict.

*Sharing* is when team members communicate their ideas to one another. *Co-construction* is when team members contribute their thoughts to supplement each other’s ideas. *Constructive conflict* is when team members with different opinions use their differences to find a common vision. Aside from these three primary TLBs, there are also auxiliary behaviours that have been shown to facilitate TLBs:

1. task and process reflexivity,<sup>20</sup>
2. error communication,<sup>21</sup>
3. task learning,<sup>22</sup>
4. boundary-crossing,<sup>23</sup> and
5. team experimenting.<sup>24</sup>

*Task and process reflexivity* is when team members reflect together on past processes specifically to improve their future processes. *Error communication* is when team members share their mistakes so

that other team members can learn and avoid the error. *Task learning* is when team members share tips to help other members complete their tasks more efficiently. *Boundary crossing* is when team members enquire from individuals outside the team to gain new knowledge and disseminate it to the rest of the group (i.e. sharing). *Team experimenting* is when team members trial new team processes to improve how they work together.

While organizational learning researchers have examined and reported these TLBs in many disciplines,<sup>25</sup> these behaviours have only been recently reviewed and measured in the architecture discipline.<sup>26</sup>

### Student-centered learning framework

Today there is an increasingly diverse and heterogeneous student body. This change in demographics is challenging the traditional ways students are taught. To address this diversification, the nuances of student needs can be acknowledged and handled by moving the attention from the teacher to the student.<sup>27</sup> While evolving a traditional teaching approach to a student-centered learning (SCL) model needs significant effort,<sup>28</sup> evidence shows that SCL models reap greater learning rewards.<sup>29</sup> Research also shows that SCL models are already used in architecture and design pedagogy, though they are more commonly reported as technology-based learning pedagogy.<sup>30</sup> To create a student-centered team learning framework, I referenced Lea et al. seven tenets of SCL (see Table 1).<sup>31</sup>

#	SCL Tenet	Description
1	Active learning	Activities that involve learners to engage and interact with the learning materials beyond cognitive understanding.
2	Deep learning and understanding	Activities that enable students to internalize and connect learning concepts with their learning experience
3	Increased responsibility and accountability	Providing students with greater ownership of their learning experience, where they determine and pursue their own learning goals.
4	Sense of autonomy	Providing students with the skills to find information and build knowledge, as opposed to giving them the expected knowledge.
5	Teacher and learner interdependence	Teachers become learning guides where students can seek assistance when required and develop ideas together.
6	Mutual respect	Students respect both teachers and peers, which enables students to see their peers as individuals to learn from and enables teachers to observe more accurately students' responsibility and autonomy.
7	Reflexive approach to teaching and learning	Teachers and students reflect on past learning experiences to iteratively improve ways of learning.

*Table 1 Lea et al.'s seven tenets of student-centred learning*

### TEAM LEARNING CONCEPTS WITHIN THE SCL FRAMEWORK

The SCL aspects described above provide a suitable and uniform structure to conceptually connect team learning constructs (as researched by Tucker et al. and Tan) in architectural pedagogy and practice. Table 2 and 3 show these connections and their rationale.

<b>Constructs</b>	<b>SCL tenets</b>	<b>Rationale for linkage</b>
Knowledge and skills	Active learning	As students bring different knowledge and skills to the team, each student actively engages and learn from one another to leverage one another's expertise and skills.
	Mutual respect	Students need to respect and accept each other's differences before they can learn from each other's knowledge and skills.
Learning and personality styles	Deep learning and understanding	Students internalize that there are many learning and personality styles to learn how to work with different types of people in future collaborations.
	Mutual respect	Students need to respect that everyone has different learning and personality styles to effectively work with and learn from one another's differences.
Attitudes and Motivation	Mutual respect	Students need to accept that everyone has different attitudes and motivation towards teamwork before they can work learn positive attitudes and motivations from one another.
	Reflexive approach	Students reflect as a team and learn from their past teamwork experiences to establish positive team processes.
Leadership and role	Increased responsibility and accountability	Students negotiate amongst themselves different roles and responsibilities to maximize their own learning goals.
Team climate	Increased responsibility and accountability	Students are responsible for maintaining a supportive team environment and are held accountable for their actions when they negatively upset the 'psychological safety' of the environment.
	Mutual respect	Students need to respect one another's opinions to maintain a psychologically safe environment that continues to encourage each other to share their ideas.
Team composition	Deep learning and understanding	Students internalize that there are people are different and have different experiences to learn how to work with a range of people in future collaborations.
	Mutual respect	Students need to respect one another's differences to learn from different perspectives.
Team cohesion	Increased responsibility and accountability	Students are responsible for maintaining a cohesive team throughout the project and are held accountable of their own engagement with the rest of the team.
	Teacher/learner interdependence	Students become responsible for creating team cohesion as opposed to relying on teachers to resolve the lack of cohesion.
Coordination	Active learning	Students report back to the team and engage with one another's individual progress to ensure the design project develops on time.
Communication	Active learning	Students may communicate differently, which require team members to also learn of how one another prefers to communicate and adjust accordingly to accommodate one another's communication preference.

<b>Constructs</b>	<b>SCL tenets</b>	<b>Rationale for linkage</b>
Idea evaluation	Deep learning and understanding	Students learn and internalize how one another develops and evaluate ideas, so that the team can develop a team-based idea evaluation process.
Decision making	Deep learning and understanding	Students learn and internalize one another's perspective and decision-making approach, so that the team can develop a team-based decision-making process.
Conflict management	Active learning	Students learn how to differentiate between a constructive and destructive conflict.
	Deep learning and understanding	Students learn through observation and experience of their team processes how constructive and destructive conflicts can occur, to facilitate the former while avoiding the latter.
	Teacher/learner interdependence	Students become responsible for avoiding and de-escalating destructive conflicts, as opposed to relying on teachers to resolve negative conflicts between members.
	Mutual respect	Students need to respect one another's differences in opinions before they can develop a constructive conflict of ideas.

*Table 2. Linking team learning in architectural pedagogy to SCL tenets*

<b>Constructs</b>	<b>SCL tenets</b>	<b>Rationale for linkage</b>
Sharing	Active learning	Students learn of each other’s perspectives and ideas.
	Mutual respect	Students need to respect one another to enable each other to share their ideas openly.
Co-construction	Active learning	Students engage with one another’s ideas to develop each other’s ideas.
	Deep learning and understanding	Students learn and internalize one another’s perspectives, so that the team can develop a team-based idea.
Constructive conflict	Active learning	Students learn how to differentiate between a constructive and destructive conflict.
	Deep learning and understanding	Students learn through observation and experience of their team processes how constructive and destructive conflicts can occur, to facilitate the former while avoiding the latter.
	Teacher/learner interdependence	Students become responsible for avoiding and de-escalating destructive conflicts, as opposed to relying on teachers to resolve negative conflicts between members.
	Mutual respect	Students need to respect one another’s differences in opinions before they can develop a constructive conflict of ideas.
Error communication	Deep learning and understanding	Students learn from one another the root causes of errors and internalize the knowledge shared to avoid repeating the mistake.
	Teacher/learner interdependence	Students learn from one another their own mistakes, as opposed to relying on teachers to identify team errors.
Task and Process reflexivity	Reflexive approach	Students reflect on their completed tasks and team processes to learn how to improve their team processes.
Task learning	Sense of autonomy	Students gain confidence to share their skills in complete tasks effectively with one another.
Boundary crossing	Sense of autonomy	Students gain confidence and skills to seek out solutions from outside their team.
	Teacher/learner interdependence	Students find knowledge on their own, as opposed to relying on teachers to provide them with the solutions.
Team experimenting	Active learning	Students learn how to trial, test, and apply new ways for effective team processes.
	Sense of autonomy	Students rely on themselves to gain experience and new knowledge on effective team processes.

*Table 3. Linking team learning in architectural practice to SCL tenets*

### **STUDENT-CENTERED TEAM LEARNING FRAMEWORK**

Based on the analysis, I propose a student-centered team learning framework for students to understand, apply, and evaluate their team learning processes (see Table 4).

<b>Understanding teamwork</b>	<b>Applying team learning process</b>	<b>Evaluating team processes</b>
Knowledge and skills	Sharing	Error communication
Learning and personality styles	Co-constructing	Task and process reflexivity
Attitudes and motivation	Constructive conflict	Idea evaluation
Leadership and role	Task learning	Decision-making
Team climate	Boundary crossing	Conflict management
Team composition	Team experimenting	
Team cohesion	Coordination	
	Communication	

Table 4. SCL framework for architecture students on team learning process

### Recommendation for students

Before starting teamwork, students should seek to understand team members' 1) knowledge and skills, 2) learning and personality styles, and 3) attitudes and motivation. They will also need to understand how to 1) maintain a psychologically safe team climate, 4) leverage the opportunities presented by their team composition, and 5) how to maintain team cohesion.

During their teamwork, students should seek to perform workplace team learning processes, specifically 1) sharing of ideas, 2) co-constructing ideas, and 3) conducting constructive conflict. Additionally, they should also 1) share their knowledge on how to complete tasks effectively (task learning), 2) approach members outside their team to learn new information (boundary crossing) and 3) experiment with new ways of working as a team (team learning). These processes can be done by 1) coordinating their task progress and 2) communicating ideas and progress with each other.

Finally, students should evaluate their team learning processes by 1) reflecting on their processes and completed tasks to find new ways of improving their teamwork and 2) communicating their mistakes with one another so that other team members do not repeat those mistakes. Additionally, they should also continuously evaluate how the team 1) generate and evaluate ideas, 2) make decisions, and 3) manage team conflicts, so that their design projects reflect the entire team's input.

### Recommendations for studio leaders

While educators may intervene to manage student teams and resolve team troubles immediately, it prevents students from independently learning to address teamwork challenges and gaining teamwork experience crucial in their future careers. Instead, before groupwork commences, educators should facilitate discussions in student teams around the different team factors that impact teamwork (i.e. understanding). Additionally, educators should encourage students to be aware of the different types of team learning processes (i.e. applying) they can use during group work and review their team processes regularly (i.e. evaluating) to improve their teamwork skills. Finally, revisiting Tucker et al.'s IPO framework of effectiveness in student design teams, educators must consider the remaining factors, such as *Task Structure & Description* and *Team formation*, that impact student teamwork but lie outside the student's remit.

### CONCLUSION

Groupwork provides design students with opportunities to collaborate but does not necessarily provide students with authentic teamwork experiences that they would find in the workplace. While researchers have examined how to teach and measure team learning in design studios and how team learning occurs in architecture practice, there is still no unified framework that provides students with guidance on how to re-create workplace team learning processes in design studios. By using a student-centered learning approach, team learning constructs found in architecture pedagogy and practice were analyzed, then



synthesized to provide students with a framework that guides them on what team factors to understand, what team learning processes to use in group work, and finally what to aspects of team processes they should evaluate to learn and improve their teamwork skills.

## NOTES

<sup>1</sup> see e.g. Linus Tan, 'From Reflective Practitioner to Learning Professionals: The Role of Reflecting and Learning in Architecture Teams' (Melbourne, Victoria, Australia, Swinburne University of Technology, 2021), <https://researchbank.swinburne.edu.au/items/e20941a5-21e3-4bfb-ab32-2a280e8b2823/1/>; Richard Tucker et al., *Enhancing and Assessing Group and Team Learning in Architecture and Related Design Contexts: Final Report 2014.*, 2014.

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