

Selected Active Learning Strategies as Viewed through the Lens of Self Determination Theory*

自己決定理論のレンズを通して見た選択された
アクティブラーニング戦略

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Abstract: Studies into the efficacy of Active Learning (AL) often focus on the extent to which particular pedagogic strategies are effective, however further work needs to be done on why AL strategies are impactful and the psychological models which provide insight into the principles influencing their success. This article examines several AL tasks, using the principles of Self Determination Theory (SDT) and, in particular, the three basic psychological needs as posited by this theory. A brief introduction to both AL and SDT is presented, followed by an examination of specific AL tasks, as commonly used by many practitioners and found to be effective in achieving positive learner outcomes.

Keywords: Active Learning, motivation, relatedness, competence, autonomy

要旨: アクティブラーニング (AL) の有効性に関する研究は、教育戦略によりどの程度まで効果があるのかに焦点を当てた研究がよく見られるが、AL に学習効果がある理由や、AL 教育の成功に影響を与える心理学的モデルに関してさらに調査を行う必要がある。本稿では、自己決定理論 (SDT) の原則、特にこの理論によって提示された 3 つの基本的な心理的ニーズを使用して、様々な AL タスクを精査する。AL と SDT の両方を簡単に説明後に、多くの教育実践者によって使用されている AL タスクに学習効果があるか否かを調査する。

キーワード: アクティブラーニング、モチベーション、関連性、能力、自律性

1. Introduction

Motivation in learners is positively correlated with favorable student outcomes, and as such has been the subject of extensive study and investigation by many authors. This article seeks to delve into the factors affecting student motivation, by using the principles of Self Determination Theory to analyze various active learning tasks, and cast light onto the aspects which either foster or inhibit learner motivation. Self Determination Theory (Ryan & Deci, 2000) presents a model of motivation, regulation and basic psychological

needs, encompassing a scale ranging from amotivation to intrinsic motivation. The three psychological needs of relatedness, competence and autonomy drive the processes of internalization and integration, which are key to achieving an ideal state of intrinsic motivation, where an individual is motivated by personal interest, the satisfaction of curiosity, the joy of rising to a challenge and the intrinsic enjoyment of the task. SDT has broad implications for any situation where an individual is required to act or apply themselves to a particular task. It has relevance well beyond the realm of education, but due to its explicit and concise definition of behaviour regulation, it is of particular utility in examining student motivation.

2. What is active learning?

“Active learning is anything course-related that all students in a class session are called upon to do other than simply watching, listening and taking notes.” (Felder & Brent, 2009)

“[Active learning utilizes] instructional activities involving students in doing things and thinking about what they are doing” (Bonwell and Eison, 1991).

With an emphasis on higher order thinking, metacognition and non-lecture style learning, active learning (AL) comprises activities that are formulated to enhance learner understanding and enjoyment of a topic. AL is typically student centered and requires the active involvement of students, to participate in and complete any of a broad range of activities, collectively known as active learning tasks but also referred to as collaborative, cooperative or problem-based learning (Prince, 2004). Several studies have examined and demonstrated the efficacy of AL strategies. Bonwell and Eison (1991) in their summary of literature on the topic, found that AL leads to better student attitudes, improved thinking and writing skills. Hake (1998), in a study involving the analysis of test scores of over 6000 students, concludes that AL leads to improved overall performance. Redish (1997) asserts that the form and structure of AL tasks has a larger impact on improved learner outcomes than the time spent on tasks, which would indicate the utility of more accurate methods for assessing the potential efficacy of AL tasks, and ascertaining the underlying principles at play. In an effort to contribute to the study of AL, this article seeks to interrogate a selection of relatively well-known AL activities, using the principles of Self Determination Theory (Ryan and Deci, 2000) to examine the factors impacting motivation in learners and the potential efficacy of each AL strategy.

3. Self Determination Theory

Self Determination Theory (SDT), as postulated by Ryan and Deci (2000), states that people are driven by the desire to satisfy three basic psychological needs: relatedness, competence and autonomy (see Figure 2). In SDT, relatedness refers to the desire to interact with others, connect with them in meaningful ways and to care about others. Competence refers to the drive to be effective actors and to display skill in any given task. Autonomy is the ability for individuals to make decisions, choose how they relate to a task and to the others in a group (Deci & Vansteenkiste, 2003). The satisfaction of these three basic psychological needs facilitates internalization of extrinsic motivating factors, and leads to the self-recognition and self-appreciation of values and goals (Ryan and Deci, 2000). This process of internalization of motivating factors exists along a continuum, ranging from a state of amotivation, to external motivation and finally to intrinsic motivation (see Figure 1).

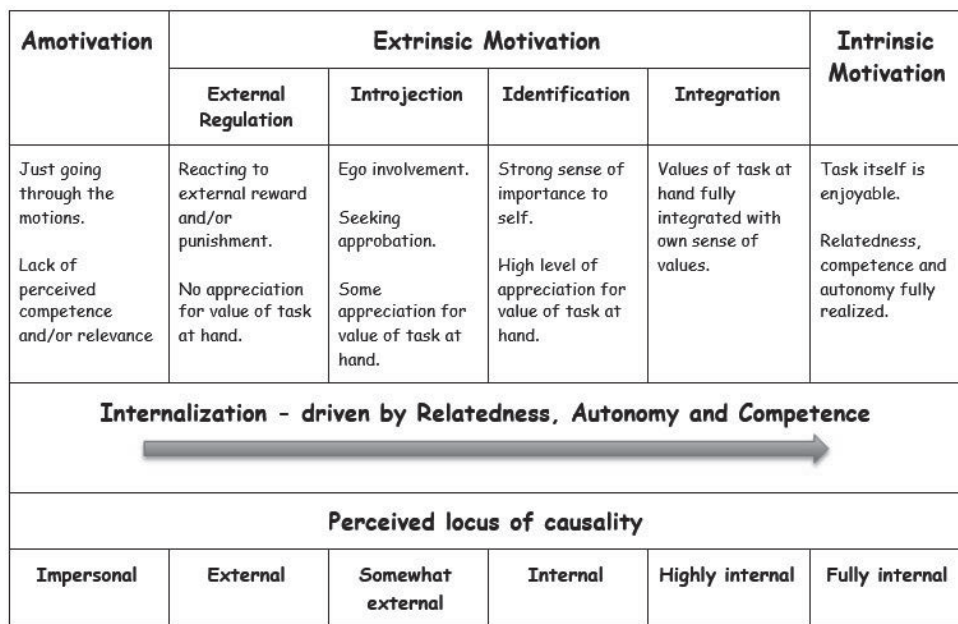


Figure 1 - Self-Determination Theory (based on Deci & Vansteenkiste, 2003)

RELATEDNESS		COMPETENCE		AUTONOMY	
SATISFIED BY	FRUSTRATED BY	SATISFIED BY	FRUSTRATED BY	SATISFIED BY	FRUSTRATED BY
Warmth, bonding and care Feeling significant to others	Alienation, exclusion and loneliness	Opportunities for extending skills Experiencing effectiveness or mastery	Sense of ineffectiveness, failure or helplessness	Sense of volition and willingness Self-endorsed actions, thoughts and feelings	Sense of pressure or conflict Being pushed in unwanted direction

Figure 2 - Basic psychological needs (based on Vansteenkiste, n.d.)

Self-determination theory is comprised of several sub-theories, two of which are particularly relevant to this study: Cognitive Evaluation Theory (CET) and Organismic Integration Theory (OIT). CET seeks to interrogate intrinsic motivation, i.e. performing a task purely for the enjoyment of the experience, in terms of the impact of external factors such as rewards, ego involvement and interpersonal controls (Center for Self-Determination Theory, n.d.). A key tenet of CET is the self-concordance model which states that when task-oriented goals are aligned with an individual's core interests and values, significant improvements in well-being accrue. Furthermore, attainment of concordant goals when combined with the satisfaction of basic psychological needs (competence, relatedness and autonomy) results in compounding of positive effects (Sheldon & Elliot, 1999). CET is particularly concerned with the central roles played by competence and autonomy, their impact on intrinsic motivation and the factors contributing to either the frustration or satisfaction of these basic psychological needs.

OIT seeks to examine extrinsic motivation, where factors influencing behaviour are external to the individual, and divides extrinsic motivation into four categories: external regulation, introjection, identification and integration (see Figure 1). As mentioned previously, these categories describe a continuum of internalization, whereby the greater the internalization of extrinsic motivation, the more autonomous the individual becomes. OIT states that this process of internalization of goals, values and beliefs is underpinned by the basic psychological needs of relatedness and autonomy (Center for Self-Determination Theory, n.d.).

A clear understanding of the factors affecting student behaviour regulation is key to implementing effective class activities. Students exhibiting *amotivation*, where the impetus for action is entirely impersonal, may feel as if they are being forced to complete

a task and are either simply complying with or resisting the teacher's instructions. Their behaviour is typified by non-intentionality, i.e. not acting with volition or with a specific purpose in mind; non-valuing, i.e. not comprehending the value of the task to themselves, others or society; incompetence, i.e. an inability to participate in or complete the task with any appreciable degree of skill; and a lack of control, i.e. feeling as though their role in class is being dictated by others and not being able to define the manner of their own involvement. *External regulation* is also motivated by external factors, such as rewards or penalties for compliance or lack thereof, and also by acquiescence to the wishes of the group. *Introjection* is typified by ego involvement and is motivated by the avoidance of negative emotions, such as guilt or anxiety, or the pursuit of affirmation. This style of regulation is also considered to be external in nature, as the impetus for action does not come from an internal source, the value of the task at hand is not aligned with the values of the actor, and the perceived rewards are extrinsic in nature. *Identification* is slightly more internal in that the student recognizes the value of the task, and attaches importance to the outcome, but has not yet fully aligned this with their own sense of values. *Integration*, where a student has fully internalized the values and outcomes of a task with their own personal goals and sensibilities, is a more internal form of regulation and more adequately satisfies the psychological needs of relatedness, competence and autonomy. And finally, *Intrinsic motivation*, fully internalized and integrated, where a student acts out of the inherent enjoyment of the task and where the three psychological needs of relatedness, competence and autonomy are fully realized.

4. How does SDT relate to active learning?

The principles of SDT describe the factors underlying motivation and the mechanisms by which external controls become internalized, and an individual is brought closer to an idealized state of intrinsic motivation. For an active learning strategy to be applied successfully in the classroom, practitioners need to have a clear understanding of the elements at play and the theoretical basis for effective engagement with and optimized benefit from lesson activities. For these reasons, the next section of this article analyses a selection of active learning tasks, using the theoretical framework of SDT to describe the factors which impact learner motivation. Particular attention is given to basic psychological needs (see Figures 3-9) due to their central roles in the process of internalization, as described by SDT (Ryan and Deci, 2000).

5. Analysis of selected active learning tasks

Think-pair-share (Felder and Brent, 2009) is a popular Active Learning strategy with potential for many possible variations and customization. The basic concept is to assign a task to the class to be completed individually, then form pairs and have students compare their answers, and lastly call on the pairs to report their findings to the class. This is a very flexible format which is easy to adapt to online, hybrid or face to face learning environments and lends itself well to online platforms such as Zoom. It works best if the initial, individually performed phase of the task is allotted a relatively short time limit, and then during the pair-work phase, for the teacher to monitor the pairs and provide feedback and encouragement as needed. If the task is of sufficient difficulty to interest the more proficient students, but still within reach of most of the class, the psychological need of competence will be catered for, and the collaborative aspect of the pair work phase will satisfy the students' need for relatedness. The nature of the task assigned by the teacher can potentially impact the degree of autonomy afforded to the students, with rigidly structured activities providing the least, and open-ended tasks the greatest freedom and opportunities for exercising choice. Autonomy supportive learning has been shown to encourage intrinsic motivation (Ryan and Deci, 2020), and by doing things such as acknowledging student opinions, provisioning choice, being responsive to student comments and sentiments, practitioners can help to create an environment which fosters the development of autonomy. Allowing students to exercise their own preferences during a classroom activity and allowing them to take ownership of the process has also been demonstrated to be closely correlated with intrinsic motivation (Bao and Lam, 2008).

Relatedness		Competence		Autonomy	
✓	✗	✓	✗	✓	✗
Pair-work	Short time frame may limit interaction	Optimal challenge	Less proficient students may struggle with the task	Ability to choose how to solve the task individually	Narrowly defined tasks may limit autonomy
Reporting results back to the class encourages discussion between pairs	Poorly matched partners may experience alienation or exclusion	Recognition of competence by partners and class members	Most proficient learners may be bored with the task	Acknowledgement of opinions	Dominant partner may overrule choices
Well matched partners create an atmosphere of inclusion and acceptance	Reporting back to the class may create excessive competition		Negative feedback may impact competence	Clear explanation of task encourages autonomy	Time limits may discourage autonomy

Figure 3 - **Think-pair-share** basic psychological needs summary

Think Aloud Pair Problem Solving (Felder and Brent, 2009) is a pair-work activity where one student is the “explainer” and the other is the “solver”. The pairs are given a problem to solve, the explainer reads the problem out loud, and then the solver proceeds to work out the answer, constantly talking about their reasoning and explaining their thought process as they go. The explainer doesn’t try to solve the problem, but only provides feedback, hints and support as needed. Once the pair have arrived at a satisfactory answer the teacher can call on random pairs to deliver their solution. The activity can be repeated, changing pairs and assigning new tasks, as time allows. Once again, this activity works best if the pairs are given a short time-frame to complete the task, and the teacher should be sure to monitor the pairs as they work through the activity. This strategy has been shown to be particularly effective in achieving improvements in proficiency and thus satisfies the psychological need for competence, central to the principles of SDT. Competence, as it pertains to SDT, is characterised by an individual’s own perception of skill, improvement or ability to reach a self-defined target, and improvement in perceived competence has been linked with enhanced motivation (Ryan and Deci, 2002).

Praise can also positively impact self-image and perceived proficiency, but practitioners should take care to ensure that it is in line with the intrinsic interests and values of learners, as this has been shown to be positively correlated with motivation, whereas praise that is seen as being linked to extrinsic factors such as imposed goals can have the opposite effect (Deci, Koestner and Ryan, 1999). The psychological need of relatedness is fostered by the extensive communication carried out during a *Think Aloud Pair Problem Solving* task, which is key to the internalization of extrinsic controls and is a central tenet of OIT (Ryan and Deci, 2002).

Relatedness		Competence		Autonomy	
✓	✗	✓	✗	✓	✗
Pair-work	Short time frame may limit interaction	Optimal challenge	Less proficient students may struggle with the task	Clear explanation of task empowers choice making	Narrowly defined tasks may limit autonomy
Extensive discussion between “explainers” and “solvers” leading to increased empathy	Poorly matched partners may experience alienation or criticism	Recognition of competence by partner and class members	Most proficient learners may be bored with the task	“Solvers” choose how to solve the task based on partner feedback	Dominant partners may criticize choices
Rotating partners enables interaction between more learners		Interactive nature of the task leads to improved proficiency		Switching roles enables both partners to exercise choice	
		Iteration of the task allows for further improvements in proficiency			

Figure 4 - *Think Aloud Pair Problem Solving* basic psychological needs summary

Concept Tests (Felder and Brent, 2009) are a variation on Think-Pair-Share, where a series of multiple-choice questions are posed to the class, the student responses for which are then displayed to the class in graphical form, then the students are placed in pairs and encouraged to reconcile their answers, and finally the resulting answers are again displayed to the class as a chart or graph. This works well with Google Forms and similar platforms, using functions for creating multiple choice questions and charting the responses, and when coupled with Zoom or Microsoft Teams, the pair-work can be integrated seamlessly into the activity.

The pie chart or graph of student responses helps to align the thought processes of individual students with the rest of the class and thus encourages internalization and integration, both key components of behaviour regulation, leading to improvements in motivation (Ryan and Deci, 2000).

The main weakness of concept tests is the lack of opportunity for exhibiting autonomy, resulting from the relatively rigid structure of multiple-choice questions. The ability to exercise choice in line with intrinsic interests and values is key to satisfying the psychological need of autonomy, and environments which thwart these needs diminish motivation, growth and wellbeing (Ryan and Deci, 2002). Moreover, provision of choice has been seen to stimulate curiosity in students lacking intrinsic motivation (Schutte and Malouff, 2019), and the ability to exercise agency in classroom environments has been demonstrated to increase intrinsic motivation (Patall, Cooper and Robinson, 2008).

Relatedness		Competence		Autonomy	
✓	✗	✓	✗	✓	✗
Pair-work	Short time frame may limit interaction	Optimal challenge	Displaying class results highlights incorrect responses		Rigidity of MCQ format limits autonomy
	Circumscribed nature of MCQ format may limit meaningful discussion	Displaying class results reinforces correct choices and bolsters confidence	Less proficient students may struggle with the task		Dominant partner may criticize choices
		Interactive nature of the task leads to improved proficiency	Most proficient learners may be bored with the task		

Figure 5 - **Concept Tests** basic psychological needs summary

Concept Maps (Novak and Cañas, 2006) illustrate the relationship between ideas in a simple, striking and instructive visual format, using a central node connected to a network of interrelated nodes. Students may already be aware of the basic ideas behind

concept maps but a detailed demonstration by the teacher will help to boost student confidence and improve task outcomes. In a face to face lesson the demonstration can be carried out on the board, followed by breaking the class into groups and handing out large sheets of paper for each group to complete their concept map. When using an online or hybrid environment this can be achieved by using either online platforms or PC software.

Concept maps help students to visualize ideas, draw inferences and broaden their understanding of concepts. When deployed in active learning, concept maps are best utilized in small groups, so as to capitalize on the collective insights of the group. Online conferencing platforms such as Zoom or Microsoft Teams can also be used to demonstrate how to make a concept map, break the class up into small groups, monitor the groups, and then display the students' work to the class. Discussion between group members facilitates the basic psychological need of relatedness which is strongly correlated with the internalization of extrinsic controls and facilitates learning (Ryan and Deci, 2002). Relatedness could potentially be curtailed by short time limits for the activity, or feelings of alienation among the less assertive group members (Cook et al., 2016), and as such, team building skills and effective communication are key to achieving relatedness in an active learning environment (Johnson, Johnson and Smith, 1998). Autonomy is facilitated by the open-ended nature of concept maps, encouraging students to be actively involved in exploring the connections between ideas, expanding their knowledge of the subject, discuss options and make choices. Of the three basic psychological needs as defined by SDT, autonomy is most closely linked with creativity, flexibility, satisfaction, physical and psychological health (Deci, et al, 1994).

Relatedness		Competence		Autonomy	
✓	✗	✓	✗	✓	✗
Group work	Short time limit may constrain interaction	Optimal challenge	Displaying class results may create an overly competitive environment	Open ended nature of concept maps encourages choice making	Dominant partners may criticize choices
Exploring the connections between ideas requires extensive communication	Less assertive group members may experience alienation	Clear explanation of task bolsters confidence	Less proficient groups may struggle with the task	Group acknowledgement of individual member's ideas improves autonomy	
		Interactive nature of the task leads to improved proficiency			

Figure 6 - *Concept Maps* basic psychological needs summary

Structured Problem Solving (Barkley, et al, 2014) provides a framework for approaching complex tasks and encourages students to separate tasks into smaller steps, and teaches them to identify, analyse and solve complex problems without being overwhelmed by the magnitude of the task at hand.

This active learning strategy works best with problems which require higher level cognitive processes (Bloom's taxonomy can be useful here) and the teacher should model the recommended problem-solving procedure to the class with an example. The following is a typical problem-solving procedure which can be used to approach a variety of complex tasks:

“(a) identify the problem; (b) generate possible solutions; (c) evaluate and test the various solutions; (d) decide on a mutually acceptable solution; (e) implement plan, and (f) evaluate the results.” (Blended Learning Toolkit, n.d.)

After modelling the procedure, break the class into small groups and have them complete a complex problem in a timed activity. It is important to monitor progress within the groups and encourage full participation of all members. The close interaction and cooperation of group members engenders relatedness, the open ended and complex nature of the procedure encourages autonomy and the successful completion of the task develops competence, thus leading to an increasing degree of internalization and integration (Ryan and Deci, 2000). The multi-stage nature of Structured Problem Solving requires a thorough explanation by practitioners, and if carried out effectively this explanation can create an environment conducive to autonomy (Cook et al., 2016), which in turn is bolstered by the open-ended nature of the task and the requirement of full participation by group members. Care should be taken to not rigidly specify how each step of the task is to be carried out, so as to not discourage choice making and the expression of agency. The achievement of a complex task through a multi-step activity such as this, facilitates improved proficiency and so provides for the psychological need of competence. It is important to select a problem which is of an appropriate level for the student cohort, as optimal challenge is key to the pursuit of competence (Ryan and Deci, 2002).

Relatedness		Competence		Autonomy	
✓	✗	✓	✗	✓	✗
Group work	Less proficient students may feel alienated from group	Optimal challenge	Less proficient students may struggle with the task	Open-ended task and multi-stage process foster autonomy	Pre-stated objective may limit autonomy
Working through the problem-solving steps encourages extensive communication	Dominant group members may criticize opinions	Inclusive, interactive and multi-stage nature of task empowers proficiency improvements	Most proficient learners may be bored with the task	Choice-making sanctioned	Time limit may constrain self-expression
Relatively generous time limit and complex nature of task enhance relatedness				Clear explanation of task provisioned	

Figure 7 - *Structured Problem Solving* basic psychological needs summary

Case Studies (Barkley, et.al., 2014) present scenarios, either factual or fictitious, along with a short case history and a dilemma. Students are required to examine the background of the case study and bridge the gap between theory and practice, the classroom and the workplace, by engaging critical thinking skills to choose the best solution. Case studies can be tailored to suit the proficiency level of the class and students can either be given alternative answers to choose from or asked to construct their own answers. Case study activities work well in groups and they are particularly well suited to hybrid learning environments, allowing online students and on-campus students to collaborate, express their opinions, discuss alternatives, critique each other's ideas and arrive at a consensus. Once groups have produced answers, discuss them with the class, have students choose the best answer (using an online poll with Google Forms, etc), and then present the actual solution to the scenario. Case studies are a highly engaging active learning strategy, which satisfy all three of the psychological needs of SDT, and facilitate internalization and integration due to the inclusive, reciprocal, choice driven nature of the activity. The difficulty level of Case Studies can be tailored to suit the student cohort and lesson objectives, with the simplest examples taking the form of multiple-choice questions and the more complex tasks requiring a multi-stage process to arrive at a satisfactory answer. As such, a sufficient and inclusive explanation of the task is crucial to successful student engagement and facilitation of autonomy, as is the provision of choice and opportunity for open expression of ideas (Ryan and Deci, 2002). Furthermore, studies into autonomy supportive environments have demonstrated causal links with improvements in perceived competence and grades (Black and Deci, 2000), and enhanced learner engagement (Nunez and Leon, 2019).

Relatedness		Competence		Autonomy	
✓	✗	✓	✗	✓	✗
Group work	Less proficient students may feel alienated from group	Optimal challenge	Excessive difficulty or uninteresting task may hamper competence	Clear explanation of task by teacher	MCQ format may limit autonomy
Inclusive environment		Inclusive and interactive nature of task engenders proficiency	Negative feedback may impact self-confidence	Acknowledgment of opinions	Time limit may constrain self-expression
Appreciation of opinions	Dominant group members may criticize opinions	Positive feedback		Open-ended solutions to case study empower autonomy	

Figure 8 - *Case Studies* basic psychological needs summary

Three Step Interviews (Blended Learning Toolkit, n.d.) are carried out by forming pairs, having the students interview each other and then report back to the class. As with other Active Learning tasks, the complexity of the activity should be calibrated to the ability level of the class and the time limit for the interviews should encourage rapid fire communication. Rotate the pairs as needed, and then have them report back the answers given by partners. The reporting back segment of the activity works best if the interview questions encourage interesting or entertaining answers. Internalization, integration, relatedness and competence are encouraged by the rotation of partners and multiple rounds of interviews in this activity. The level of autonomy exhibited by participants will depend on the nature of the interview questions and the proficiency of the student cohort. The key psychological need being catered to in Three Step Interviews is relatedness as interaction between partners is required for successful completion of the activity. It is important for an inclusive and reciprocal environment to be established for effective communication to be fostered in a manner conducive to relatedness. Alienation and criticism are anathema to successful interaction and tend to stifle the development of competence and autonomy (Ryan and Deci, 2020), while praise delivered in such a way as to be aligned with intrinsic interests and sincerely held values results in internalization of extrinsic controls, and a shift towards intrinsic motivation, as described by OIT (Deci, Koestner and Ryan, 1999).

Relatedness		Competence		Autonomy	
✓	✗	✓	✗	✓	✗
Pair work	Less proficient students may feel alienated	Optimal challenge	Excessive difficulty or uninteresting task may hamper competence	Clear explanation of task by teacher	Pre-formulated interview questions may limit autonomy
Inclusive environment		Inclusive and interactive nature of task engenders proficiency	Negative feedback from class may impact self-confidence	Acknowledgment of opinions	Time limit may constrain self-expression
Appreciation of opinions		Positive feedback from class		Open-ended interview questions	

Figure 9 - *Three Step Interviews* basic psychological needs summary

6. Conclusion

The principles of Self Determination Theory and the internalization of extrinsic controls, as informed by the basic psychological needs of relatedness, competence and autonomy are key to understanding the theoretical basis for the utility and success of active learning strategies. As this article has argued it is not enough to simply know that an active learning task will most likely work, but that it is vital to know why it succeeds in motivating learners to achieve favourable outcomes and optimize their learning experience. The sub-theories of Cognitive Evaluation Theory and Organismic Integration Theory (Ryan and Deci, 2002) adequately describe the factors which affect both intrinsic and extrinsic motivation, and provide a roadmap for more effective implementation of classroom pedagogies.

*Some elements of this article also appear in my presentation entitled “Active learning strategies for hybrid online lessons” (McPhail, 2021, June 5).

References

- Ackerman, C. (2020). Self-determination theory of motivation: why intrinsic motivation matters. *Positive Psychology*. Retrieved from <https://positivepsychology.com/self-determination-theory>
- Bao, X. H., & Lam, S. F. (2008). Who makes the choice? Rethinking the role of autonomy and relatedness in Chinese children's motivation. *Child development*, 79(2), 269-283.
- Barkley, E. F., Cross, K. P., & Major, C. H. (2014). *Collaborative learning techniques: A handbook for college faculty*. John Wiley & Sons.
- Black, A. E., & Deci, E. L. (2000). The effects of instructors' autonomy support and students' autonomous motivation on learning organic chemistry: A self-determination theory perspective. *Science education*, 84(6), 740-756.

- Blended Learning Toolkit. (n.d.). UNIVERSITY OF WISCONSIN-MADISON.
<https://blendedtoolkit.wisc.edu/deliver/activelearning/>
- Bonwell, C. C., & Eison, J. A. (1991). *Active Learning: Creating Excitement in the Classroom*. ERIC Digest.
- Brame, C. (2016). Active learning. *Vanderbilt University Center for Teaching*. Retrieved from <https://cft.vanderbilt.edu/wp-content/uploads/sites/59/Active-Learning.pdf>
- Center for Self-Determination Theory. (n.d.). Retrieved from <https://selfdeterminationtheory.org/the-theory/>
- Cook, D. A., & Artino Jr, A. R. (2016). Motivation to learn: an overview of contemporary theories. *Medical education*, 50(10), 997-1014.
- Deci, E. L., Cascio, W. F., & Krusell, J. (1975). Cognitive evaluation theory and some comments on the Calder and Staw critique. *Journal of Personality and Social Psychology*, Vol. 31, No. 1, 81-85.
- Deci, E. L., Eghrari, H., Patrick, B. C., & Leone, D. R. (1994). Facilitating internalization: The self-determination theory perspective. *Journal of personality*, 62(1), 119-142.
- Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological bulletin*, 125(6), 627.
- Deci, E. L., & Vansteenkiste, M. (2003). *Self-determination theory and basic need satisfaction: Understanding human development in positive psychology*.
- Felder, R. M. (2007). Random thoughts: Sermons for grumpy campers. *Chemical Engineering Education*, 41(3), 183-184.
- Felder, R. M., & Brent, R. (1996). Navigating the bumpy road to student-centered instruction. *College teaching*, 44(2), 43-47.
- Felder, R. M., & Brent, R. (2009). Active learning: An introduction. *ASQ higher education brief*, 2(4), 1-5.
- Hake, R. R. (1998). Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses. *American journal of Physics*, 66(1), 64-74.
- Johnson, D. W., Johnson, R. T., & Smith, K. A. (1998). Cooperative learning returns to college what evidence is there that it works? *Change: the magazine of higher learning*, 30(4), 26-35.
- Legault, L. (2017). Self-Determination Theory. In: Zeigler-Hill V., Shackelford T. (eds) *Encyclopaedia of Personality and Individual Differences*. Springer, Cham.
https://doi.org/10.1007/978-3-319-28099-8_1162-1
- Lopez-Garrido, G. (Jan 04, 2021). *Self-Determination Theory and Motivation*.
<https://www.simplypsychology.org/self-determination-theory.html>
- McPhail, C. (2021, June 5). *Active learning strategies for hybrid online lessons* [Conference presentation]. JALTCALL2021. <https://jaltcall2021.edzil.la/session/1391>
- Novak, J. D., & Cañas, A. J. (2006). The theory underlying concept maps and how to construct them. *Florida Institute for Human and Machine Cognition*, 1.
- Núñez, J. L., & León, J. (2019). Determinants of classroom engagement: A prospective test based on self-determination theory. *Teachers and Teaching*, 25(2), 147-159.
- Patall, E. A., Cooper, H., & Robinson, J. C. (2008). The effects of choice on intrinsic motivation and related outcomes: a meta-analysis of research findings. *Psychological bulletin*, 134(2), 270.
- Prince, M. (2004). Does active learning work? A review of the research. *Journal of engineering education*, 93(3), 223-231.
- Redish, E. F., Saul, J. M., & Steinberg, R. N. (1997). On the effectiveness of active-engagement microcomputer-based laboratories. *American journal of physics*, 65(1), 45-54.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist*, 55(1), 68.

- Ryan, R. M., & Deci, E. L. (2002). Overview of self-determination theory: An organismic dialectical perspective. *Handbook of self-determination research*, 2, 3-33.
- Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology*, 61, 101860.
- Schutte, N. S., & Malouff, J. M. (2019). Increasing curiosity through autonomy of choice. *Motivation and Emotion*, 43(4), 563-570.
- Sheldon, K. M., & Elliot, A. J. (1999). Goal striving, need satisfaction, and longitudinal well-being: the self-concordance model. *Journal of personality and social psychology*, 76(3), 482.
- Vansteenkiste, M. (n.d.). *Basic Psychological Needs*. Center for Self-Determination Theory. <https://selfdeterminationtheory.org/application-basic-psychological-needs/>

