A Model for Using Data and Differentiated Instructional Strategies to Support Students' Learning Needs

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Abstract
Learning Analytics is an important area in education, with limited evidence that it improves student outcomes and supports learning and teaching needs (Viberg et. al, 2018). In a creative school, the use of data to understand students' needs is even less straightforward because many of our learning goals are more subjective and not as easily quantified. We pioneered an approach of blending the use of data with differentiated instructional (DI) strategies in a creative education setting. First, data is collected on students' abilities or needs through a quiz, survey or diagnostic task on the school's learning management system. When students come to class, the lecturer employs a DI strategy like "tiering" (Tomlinson, 2017) to better support their learning needs or abilities. Finally, a post-class survey is conducted to check on students' perceptions, which allows the lecturer to continually monitor and adapt his/her lesson activities. Survey results (n=108) from our pilot suggest that our model of using data and differentiated activities are well-received by students from different creative disciplines, with 70% to 74% of students reporting a high level of perceived competency after the lesson activities. The school has continued to pilot different ways to assess students' needs and more ways to differentiate lesson activities (e.g. compacting, flexible groupings). We hope to share this model and our experience with other teaching practitioners to move beyond a "one-size-fits-all" approach to teaching and learning.

Keywords: Differentiated Learning, Differentiated Instruction, Learning Analytics, Creative Education

INTRODUCTION

Since the Covid-19 pandemic ushered in a new age of remote and hybrid learning, teachers have creatively found more ways to engage with students on digital platforms. At Singapore Polytechnic (SP), like many educational institutions globally, a learning management system is used for teaching and learning. Aside from storing and disseminating lesson materials, our learning management system is also used to collect data about their students' learning through quizzes and surveys. It is also possible to set up assignment boxes or discussion boards where the teacher can assess students' abilities. D2L provides teachers with dashboards that summarise student performance (see Appendix A). Teachers may also download the data and perform additional analysis as necessary.

The data on the LMS allows the teacher to make informed decisions about how to run the class and what additional support or clarification is needed (Martin & Ndoye, 2016). In the process of collecting relevant data on student learning, there lies a golden opportunity to design appropriate interventions for students based on this data.

In this paper, we propose a model for using data and differentiated instructional (DI) strategies to better support students' learning needs. The model is piloted in three modules (*n = 108*) in the media, arts, and design school at Singapore Polytechnic. Results show that the use of data and DI strategies were well-received by students from different creative disciplines, with 70% to 74% of students reporting a high level of perceived competency after the lesson activities.

Differentiated Instruction

To get a clearer idea of how to design appropriate interventions based on students' different abilities, preferences, or learning styles, we reviewed the literature on differentiated instruction and strategies.

Tomlinson (2014) defines differentiated instruction (DI) as the **systematic approach where teachers modify curricula, teaching, learning pace, routines, methods, resources, and activities to honour and address the broad range of students' readiness levels, needs, interests, motivations, and learning styles to maximise their learning opportunity and capacity**. Underpinning the approach is a student and equity-based philosophy that regards diversity as normal and valuable, putting students in a safe, supportive, and intellectually-rigorous environment (Tomlinson, 2001). Tomlinson's definition of DI is highly egalitarian and democratic and reflects a learner-centric curriculum model.

In Renzulli and Reis (1998) work in comparison, it distinguishes and prioritises the higher ability students with the intention of elevating their learning. It gives us a perspective on DI being an efficient teaching and learning strategy based on student abilities. Renzulli and Reis focus on DI functioning as a teaching strategy to serve students who are identified as having advanced abilities (skills, creativity, focus). It focuses on the DI strategy - curriculum compacting, as its main strategy for differentiation. Curriculum compacting, also mentioned briefly by Tomlinson (2014) as a technique for DI, is one which quickly identifies students level of mastery in their materials and allows teachers to make adjustments to curriculum to replace the content students already mastered with new content, enrichment options, or other activities (Renzulli and Reis, 1998). Although the function of DI in this aspect is to keep content academically challenging for higher ability students, it also goes to demonstrate that

DI can go beyond its equity nature, and be effective even as a learning strategy to elevate the readiness of students through differentiating the instructions to accommodate their individual strengths.

Ultimately, not all DI are the same. Different DI prioritises different dimensions and thus foregrounds different aspects of DI. In Bondie et al. (2019), it analysed how 28 U.S based research studies conducted between 2001 to 2015 have defined, described, and measured changes in teaching practices related to implementation of DI. How we frame DI influences the purpose DI, the objective of DI, the materials used or made, the data type being gathered and interpreted, the skills required of the teacher, the level of teacher decision-making control, and the necessary teacher professional knowledge. Hence the type of DI definition selected can influence the teachers' practice, and will thus influence their experience and perception.

As SP's mission is to prepare our students to be beyond work ready, our curriculum aims to prepare students to be life ready and world ready. So beyond the mastery of skills, it is our mission to educate students to be purposeful, motivated, self-directed inspired learners who engage in life-long learning (Singapore Polytechnic, 2021). Hence, a framework that is more balanced and learner-centric is needed. At the same time, most teachers in SP do not know, and have not used DI in their classes before. So the definition needs to provide a clear definition that helps teachers to get familiar with the concept. Therefore, the framework we have chosen for the purpose of our research is Tomlinson's (2014) definition of DI. In support of this main definition, we will use the other frameworks mentioned in our review as supplementary definitions when necessary. We will also use Tomlinson's (2014) list of frameworks, toolkits, strategies and case studies to craft our differentiated instructions.

Factors that may affect DI implementation in our school

Sociocultural factors

In Singapore's public school sociocultural context, teachers have a more authoritarian approach as compared to the teachers in the west where DI is conceived. It is to our teachers' preference to have a "stronger hierarchical relationship and teacher's authority" (Heng and Song, p.607, 2020). However, being in the media, arts and design school in SP, the preference in some classes are shifted to a more democratic classroom environment instead (Waterman, 2007).

Singapore teachers from public schools associate quiet and cooperating classes to be 'in-control'. They control what is being taught based on their perception of the students and knowledge that is delivered, rather than co-constructing the content with the students (Heng and Song, 2020). Teachers shared their views that there are expectations that teachers need to be in control of their classroom, along with the idea that learning can only be done when students are quiet and attentive. This adds an external pressure on how the classes can be designed. The situation is quite different in our school. Here, lessons are run in small tutorial classes where students are encouraged to participate actively in the learning process. Studio-based modules are conducted by lecturers who are facilitators of learning rather than just deliverer of content. In some cases, students participate in projects that work directly with industry partners on projects in highly authentic experiences. During these projects students have the chance to work in small teams and to hone skills that are beyond the content of the module. These key features of the curriculum are some contributing factors as to why our

school could be different from conventional public schools. We believe that there could potentially be better implementation of DI in our school because of its unique creative and egalitarian culture even though it is still part of a national educational system and milieu.

SP media, arts, and design school teachers could be less results-oriented and more process-oriented as compared to Public Schools in Singapore which might have an overemphasis for what can be tracked and measured. However since teachers of our school are generally also local Singaporeans, perceptions could be deeply rooted as teachers are inclined to teach as they were taught. The students themselves may also prefer the mode of teaching to be more instructional rather than self-directed (Heng and Song, 2020). Another possible resistance to DI implementation as part of the sociocultural context, could be a preference over standardisation as a means to ensure fairness (Heng and Song, 2020). The perception of differentiating access and differentiating the allocation of resources (time and materials) could be deemed as unfair both to the teachers and the students.

Stakeholder tensions and support

Tensions come in all directions and from different stakeholders (teacher, leadership, students, parents). When there is an introduction to new pedagogy, a significant amount of energy is needed to change what they are familiar with. The justification has to be clear, the results have to be measurable, and there has to be proof of the effectiveness of DI. Furthermore, syllabi and examinations are centrally designed and there are also expectations to report on students' progress by checking their work. The top-down pressure leads to the belief that teachers will need to handle more work to demonstrate their teaching and their students' learning. All these are factors that add to the resistance to experiment and adapt new pedagogies. However, in our school, unlike primary and secondary schools, teachers are also the curriculum designers. As subject experts in their own domains, our school's specialisations work with the relevant industries and its teachers to map out the subject syllabus. Teachers are given a healthy amount of autonomy and decision-making support. The supportive environment to experiment new pedagogies might be a factor to encourage DI implementation and might lead to a positive uptake for DI implementation in our school.

On the whole, students might not be familiar or receptive to this new mode of learning. DI has a different style as compared with the rest of the teaching styles. This might cause tension and discomfort with the students. There might also be morale issues, when students do not receive the same set of questions as the rest of the students. This might cause disgruntled students to be uncomfortable and frustrated with the teaching style (Heng and Song, 2020). In our implementation of our model, we tried to minimise this issue by ensuring that the communication to the students was fair and honest.

Differentiated instructional strategies

Differentiated instructional (DI) strategies are useful when they are aligned with lesson standards, targets, and objectives. Determining which strategy to use is a creative and fluid process involving the data collected, teachers' keen observation and a general intuition of the students. At the same time, experienced teachers also need to be knowledgeable and flexible enough to quickly change strategies to keep students interested and continue to engage them in learning. We have identified DI strategies listed by Tomlinson (2017) that are potentially useful to our school's teachers that can help students progress in their learning effectively.

Tiering is a readiness-centric DI strategy that differentiates students based on their "critical knowledge, understandings, and skills (KUDs)" (Tomlinson, p. 201, 2017). Teachers begin the process by identifying one task that aligns with the intended lesson standards, targets, and objectives. Then by varying the difficulty level to challenge advanced students to keep them in the zone of proximal development. After determining the medium and extended instructions, teachers can plan the tiering according to the level and type of scaffolding required. The differentiated instructions are then able to provide students with access to the content and push them to a better learning experience. On top of what Tomlinson (2017) has illustrated, we suggest considering the level of authenticity for the task when designing the instructions. The level of difficulty can go beyond the technical application in a higher authentic activity. Students can be challenged beyond the content and have an opportunity to hone skills beyond the content.

Interest Centers/Stations/Groups provide additional opportunities for the students to learn more deeply about a specific topic beyond the intention of the standards set by the curriculum (Tomlinson, 2017). It can go beyond providing more information for the students about the specific topic. Teachers can also consider interest centers as an extension opportunity for students to work on (individually or in teams) a particular topic or skill set. These interest centers can also be formed with readiness in mind. Students of different readiness levels can be grouped and given interesting topics that vary in their level of complexity and interest topics so that the activity can be appropriately positioned to engage the learners. It is also important to distinguish between 'centers' and 'stations' and 'groups'. When using stations, students will be expected to complete all stations to achieve a level of understanding and proficiency for a topic or skills. Centers on the other hand are independent of the curriculum, and there are no expectations for the students to move through all of the centres by the end of the lesson. At the same time, centers provide some flexibility for students to move to different centres during the lesson. Arrangements in a group however are usually fixed for the duration of the activity.

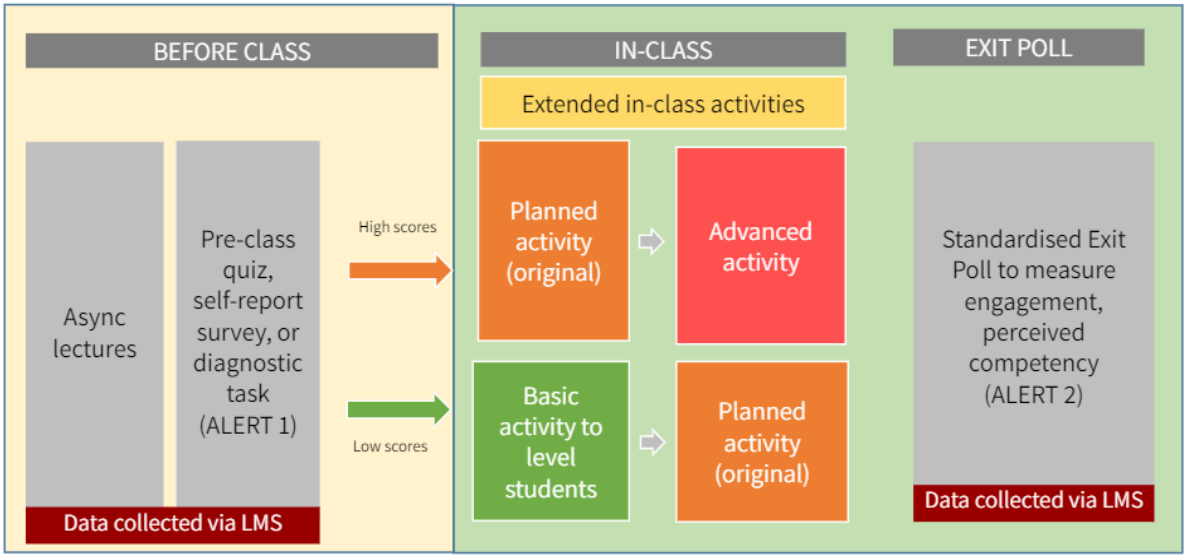
Learning Centers/Stations are areas of the classroom where students can work on their KUDs. Learning centers are usually longer in duration, and the resources provided for the students will remain accessible to the students for days or weeks. Learning stations are informal spaces for shorter-term setups that are less permanent and resources come and go after the students have finished engaging with them. Learning centers and stations are useful strategies that cater to a wide variety of student needs and may be based on readiness, language, interest, and learning profile. Ultimately it is a place to develop and apply KUDs and other areas of the lesson objectives. This DI strategy is useful for SP MAD School's teachers as it is able to accommodate diverse students' needs. Learning centers can be highly self-directed according to the tutor's instructions and allow students to learn at their own pace. At the same time, it enables tutors to break the class up into groups flexibly so the tutors are able to prescribe differentiated instructions for the students. Students who share similar traits are also able to work together and help each other with the activity.

Flexible Grouping allows students to be part of different groups throughout the duration of the module, as well as have the opportunity to work alone. The grouping can be arranged by the teachers, based on the students' readiness, interest and learning profile. The groupings can also be done in either a homogenous or heterogeneous manner to ensure the students can benefit from a mix experience. Alternatively, teachers can empower students to decide their own groupings or to randomly assign the members in the groups. Flexible grouping strategy is a good strategy for the teachers to consider implementing across the duration of the module

rather than just the duration of a single class. Flexible groupings can be used to build a sense of community and belonging among students, and encourage collaborations and knowledge co-construction among students.

A model to use data and differentiated instructional strategies

Figure 1: Our school's data-enabled flipped learning model (based on Tiering)



In this model, students are first assessed on their abilities before they come to class. The lesson in class consists of multiple activities at various tiers of support and scaffold to match students' needs. Students start with an easier activity that has easier questions and/or more scaffolding, then move on to a more difficult activity that has harder questions and/or less scaffolding. In such a lesson design, more competent students work on more challenging activities and remain engaged while teachers can spend more time with less competent students to help them complete the easier activity. Teachers can also rope in more competent students to provide peer support and teaching.

Appendix B shows an example of a lesson plan with the tiered activities. Alternative models of the possible DI classroom strategies based on Tomlinson (2017) that can be deployed are in Appendix C.

Anticipated student outcomes

The impact of differentiated instructional strategies on students' learning has been well-documented. DI strategies have been shown to have a positive impact on students' learning gains (Karst et. al, 2022), understanding of course concepts (Joseph et. al, 2013) and students' well-being and self concept (Pozas et al., 2021).

The model is expected to have an impact on is on student's level of intrinsic motivation and perceived competency. According to the self-determination theory (Deci & Ryan, 1985, 1991, 2002), three psychological needs need to be met in order for individuals to be intrinsically motivated: autonomy, competence, and relatedness. Specifically, competence needs are fulfilled when individuals perceive that they have the ability to perform a task effectively. Guay et. al (2017) found that differentiated instruction amplified the teacher's

effectiveness in the classroom and this was further mediated by students' perceived competency. Another study found that when teachers provided adequate support and scaffolding based on students' needs, intrinsic motivation and engagement increased (Hornstra et. al., 2018).

Two aspects of the model are expected to contribute to an increased sense of perceived competency and intrinsic motivation. First, from the pre-class quiz, students get an indication of which aspects of the flipped learning they have learnt. Having timely and accurate feedback about their learning has been found to help students track their learning and build perceived competency (Liu and Wang, 2004). Second, the tiered activities that are matched to students' abilities allow students to work on activities that are moderately difficult but reasonably challenging for them. Being able to complete the tasks with the appropriate scaffolding should also build perceived competency (Liu and Wang, 2004). An increase in perceived competency is then likely to contribute to increased intrinsic motivation among students (Liu & Chye, 2008).

Besides intrinsic motivation, effort and value are two other related outcomes that impact students' learning (McAuley, Duncan, & Tammen, 1989). Perceived effort is the amount of effort one puts into a learning task, while perceived value is the level of usefulness of the learning task (McAuley, Duncan, & Tammen, 1989).

As the literature review supports the impact of differentiated instruction on students' intrinsic motivation, perceived competency, effort and value, we focus on measuring students' perceptions in those areas in the post-class survey in the model. The following research questions are asked:

> RQ1: What are students' level of intrinsic motivation and perceived competency after a lesson using data and differentiated instructional strategies?
>
> RQ2: What are student's level of perceived effort and value after a lesson using data and differentiated instructional strategies?

METHOD

Research Design and Participants

The data-enabled flipped learning model was piloted in three modules from Oct 2021 – Feb 2022 (AY2122 Semester 2). In each module, two or three lessons in the semester were identified to test the model. A description of the activities that students go through in each lesson is as follows:

1) Complete e-learning before lesson
2) Complete a pre-class quiz
3) Go through a series of tiered activities that match their competency level
4) Complete a post-class survey to gather feedback

A total of 128 students across the Year 1 and 3 cohorts were involved. Table 1 shows the student profile in the modules.

Table 1: *Students' profile in the three pilot modules*

Module	No. of students (classes)	Year of Study	Diploma
Motion Capture	20 (1 class)	Year 3	Visual Effects & Motion Graphics
Motion Analysis & Techniques	42 (2 classes)	Year 1	Media, Arts, & Design (Motion Design)
Research Methods	66 (3 classes)	Year 1	Media, Arts, & Design (Integrated Marketing Communications)

Materials

The pre-class quizzes were close-ended (single-select or multi-select) questions which could be automatically graded by the LMS. They were designed to diagnose students' level of knowledge and comprehension after perusing the e-learning materials. Examples of the pre-class quizzes are in Appendix D.

The post-class survey consisted of 10 questions adapted from the Intrinsic Motivation Inventory (IMI, n.d.) (see Appendix E for the questions). Students rated their level of agreement with the statements on an 8-point scale (1 = not true at all, 8 = very true). The objective was to measure students' perception of the differentiated activities in the dimensions of enjoyment, perceived competence, effort, and value. As the questions are repeated across the dimensions, four questions, one for each dimension, are selected for reporting in this paper.

RESULTS

Post-class Survey Results

Our pilot endeavor was dynamic, adaptive, and iterative. As such, a number of differentiated lessons were piloted using earlier versions of the model and did not match the proposed model as laid out in this paper. For clarity, only results from four differentiated lessons in two modules (Research Methods and Motional Analysis Techniques) were included below as these lessons most closely matched the finalized proposed model as laid out in this paper.

Table 2: *Students' perceptions of the differentiated lessons*

Dimension		Research Methods	Motion Analysis & Techniques
Interest/Enjoyment	I enjoyed today's lesson.	91%	80%
Perceived Competence	After working on the lesson activities for a while, I felt pretty competent.	74%	70%
Effort/Importance	I put a lot of effort into this lesson.	90%	80%
Value/Usefulness	I believe doing the lesson activities could be beneficial to me.	99%	97%

Note: Questions were adapted from the Intrinsic Motivation Inventory (IMI, n.d.). Percentages are those who selected top 3 options on an 8-point scale

As shown in Table 2, the perceptions of the differentiated lessons were generally very high (74%-99%). Majority of students perceived the lesson to be enjoyable (91% & 80%), put in a lot of effort in the lesson (90% & 80%), and saw value in what they were doing (99% & 97%). Perceived competency was slightly lower though it is noted that almost three-quarters felt pretty competent after going through the differentiated lessons (74% & 70%).

The qualitative feedback from the survey also indicated that students enjoyed the activities and had high intrinsic motivation. "Fun", "Enjoyable" and "Fruitful" were some of the top words used to describe the lessons. As important as enjoyment, students indicated in the qualitative feedback that they felt that the lessons helped them to gain competency and learnt the necessary skills.

> *It helps me improve my After Effects skills as well as learn new skill sets that I have never learned before! Each lesson, it was very fun to attend class as there's always a new activity we could do. (Motion Analysis student)*

> *It felt productive as I am actively doing the task so that I can learn more effectively. (Research methods student)*

We are encouraged by the positive results and note that more work can be done in the differentiated activities to improve perceived competence.

Module Feedback

The module feedback for the 3 modules on the pilot were generally positive and above 4.0 on a 5-point scale. After the implementation of data-enabled flipped learning together with other tweaks to the module, the modules receive a higher or similar module feedback score as previous semesters (see Table 3).

Table 3: *Module feedback before and during pilot*

Module	AY1920 Sem 2	AY2122 Sem 1	AY 2122 Sem 2 (Pilot)
Motion Capture	4.36	4.35	4.58
Motion Analysis & Techniques	4.25	-	4.26
Research Methods	-	4.11	4.28

Note: Scores were the average scores on 5 standard module feedback statements used to assess module quality in Singapore Polytechnic (maximum score of 5). Research Methods and Motion Analysis & Techniques were new modules in AY2122 Sem 2. For some semblance of comparison, scores from the previous module in the old curriculum were provided.

Despite differentiated activities being used in a few and not all of the weekly lessons, in the qualitative module feedback, students specifically singled out some aspects of the activities that they enjoyed. Two aspects that students liked were the ability to track and monitor their own progress and the activities that helped them build their own self-confidence. These aspects are elaborated below.

Students being able to track their own progress - Data-enabled flipped learning also gives students the ability to track their own progress. The D2L learning management system has dashboards that show students how they are performing on pre-class quizzes and which e-learning they have completed. As mentioned by a student in Research Methods:

> *The brightspace portal is easy to use and navigate which also keeps me on track with my work. the RAT quiz is also useful for me to know how I am doing.*

Tiered activities that are hands-on help to build confidence - Corroborating the effectiveness of tiered activities in building perceived competency, many students also mentioned how the in-class lessons help them to apply their knowledge on hands-on activities. While students may not be aware that they are working on tiered activities, their sense of self-confidence is likely boosted from working on tasks that are at the appropriate level of challenge for them. One student in Motion Capture commented that the "*practical lessons helped*" and another student in Motion Analysis said that the "*in-class activities have definitely helped us get more familiar with After Effects."*. A third student in Research Methods commented:

> *In-class lessons are the best for me because they help to cement the knowledge that I learnt and give me opportunities to apply it. It is also when I get to clarify my doubts with <lecturer> and learn from my friends. Hence, it is when I feel the most confident in my learning. (Research Methods student)*

One negative feedback obtained was that some students felt confused using different learning management systems as only their pilot module was on D2L while other modules continued to use Google Classroom or Blackboard. Having a consistent learning and tracking platform for students is important in enhancing the student experience. As SP moves towards D2L for all modules, this issue should be less salient in future semesters.

DISCUSSION AND CONCLUSION

This paper proposes a model which integrates the concept of tiering (Tomlinson, 2017) with the data analytics afforded by the learning management system. In the model, lecturers get an indication of students' abilities through a pre-class quiz, a self-report survey, or a diagnostic task. Based on their abilities, they are then assigned to tasks that are tiered with different difficulties. Finally, students complete an exit poll to understand their perceptions of the differentiated lesson. This is a model that can be easily implemented by other lecturers in SP or other schools.

The model was piloted in the media, arts, and design modules and shown to have positive perceptions among students. Contrary to what Heng and Song (2020) found that students might be uncomfortable or frustrated with DI, we found that students had high levels of enjoyment of the DI lessons and found the activities to be beneficial to them. We did not see any severe morale issues as perceived competency was also found to be quite high. Module feedback at the end of the semester was as high or higher than in previous semesters without differentiated activities. Finally, qualitative comments showed that students enjoyed being able to track their own progress using the analytics afforded by D2L and that the activities helped them learn and build self-confidence.

During the pilot, several obstacles in implementing DI that were highlighted in Heng and Song (2020) were considered and addressed:

1. *Student may perceive DI as unfair as there is differentiation in resources* - We ensured that all materials were released to students after class so that students have access to all materials
2. *Classroom sizes and structures must support DI* - our pilot classes were held in classrooms where there was sufficient space and adjustable chairs and tables for spacing out arrangements
3. *Staff may perceive a large amount of preparatory work* - our proposed model builds off an existing lesson activity and adds or removes scaffolding or questions. We hope to show other teachers that it is not too much extra work to implement DI

One issue we had not looked at in this pilot implementation was parental concerns. Parents in Singapore are very results driven and may feel negatively towards DI and its assessment. They might have an issue with their child's learning progress being different from the rest of their classmates. In a competitive environment like Singapore, equity might not be perceived as fairness and parents might be resistant to DI enacted in their child's class.(Heng and Song, 2020). As we roll out more modules using data and DI strategies, it must consider the communications to parents and students in a fair and constructive manner.

Another issue raised by Heng and Song (2020) found that teachers felt incapable of enacting DI without training, development, and support to adequately respond to the diverse students' needs. Without knowing the definitions, strategies, models, and styles, teachers have expressed the lack of confidence in enacting DI (Heng and Song, 2020). To this end, we intend to run training workshops for our teachers and to provide support in their implementation of DI.

In future studies, we intend to try out more DI strategies in the model (see Appendix C). These areas will be experimented with in future semesters.

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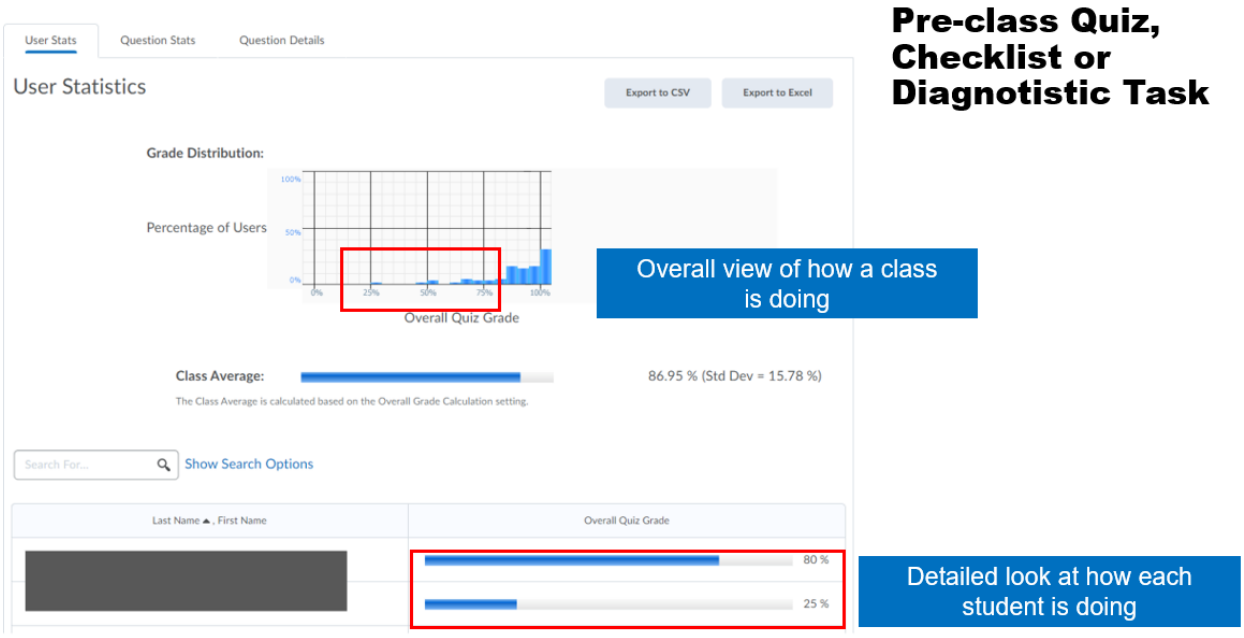
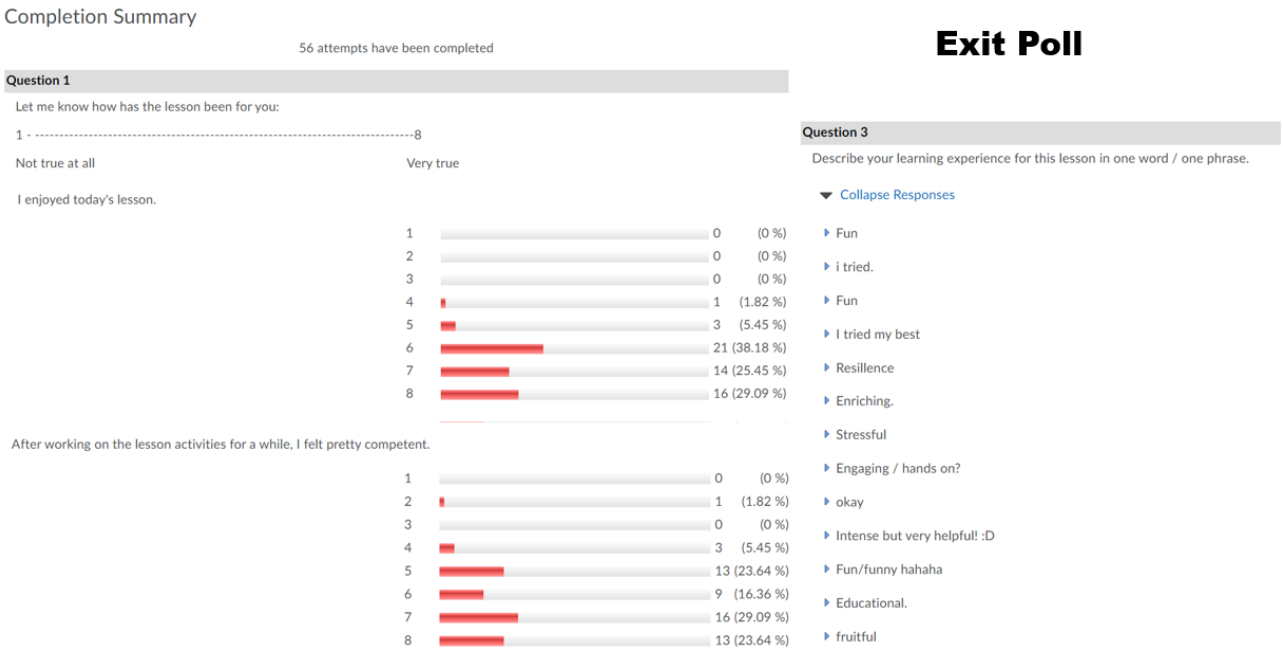
APPENDIX A

An example of the dashboards available on the D2L learning management system

Summary dashboard of students' performance on a quiz (class overall and individual student performance)

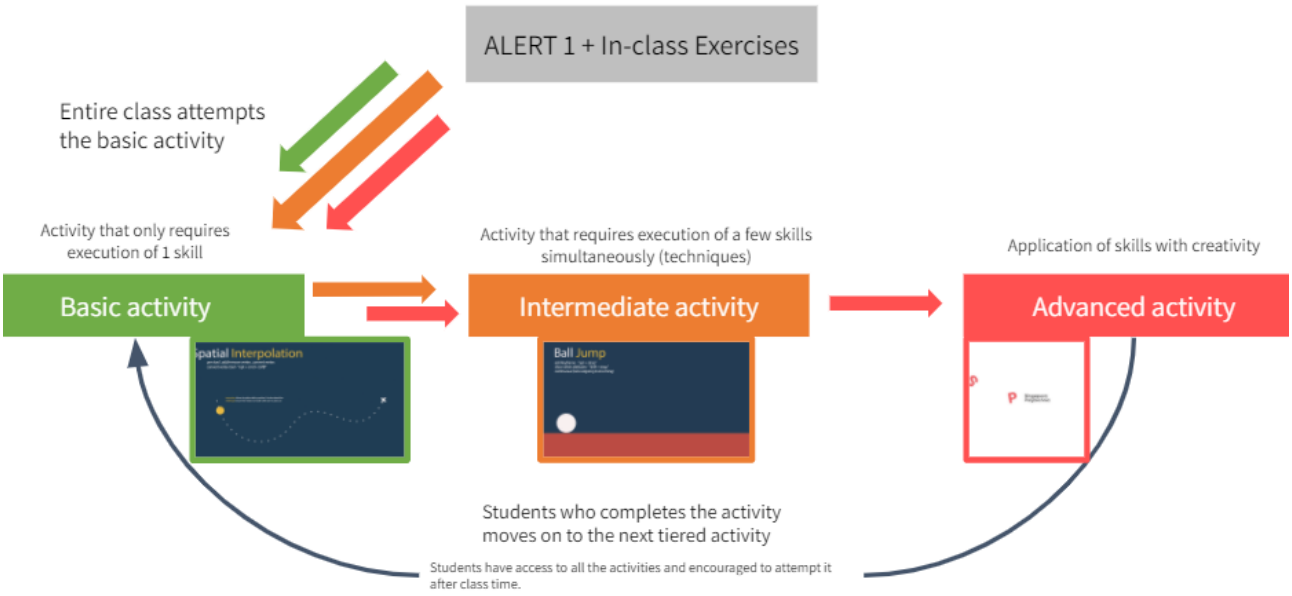


Summary dashboard of students' answers on a survey (closed-ended and open-ended questions)



APPENDIX B

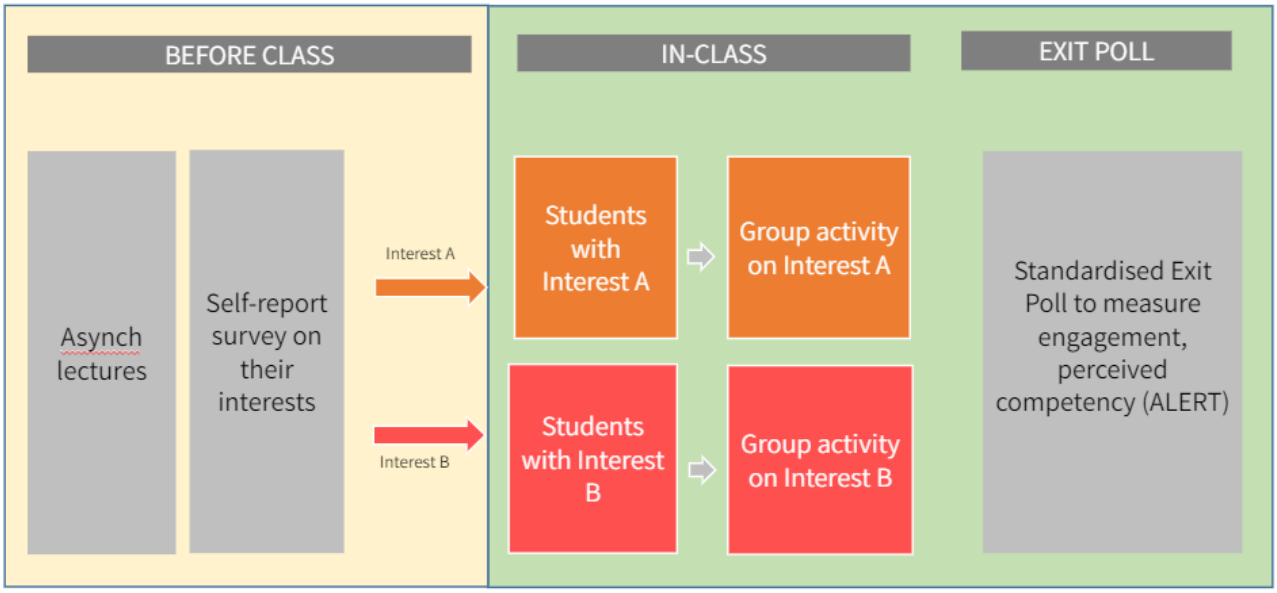
An example of how tiering is used to design activities of different difficulty levels. Students can be assigned tasks that are appropriate for their ability level.



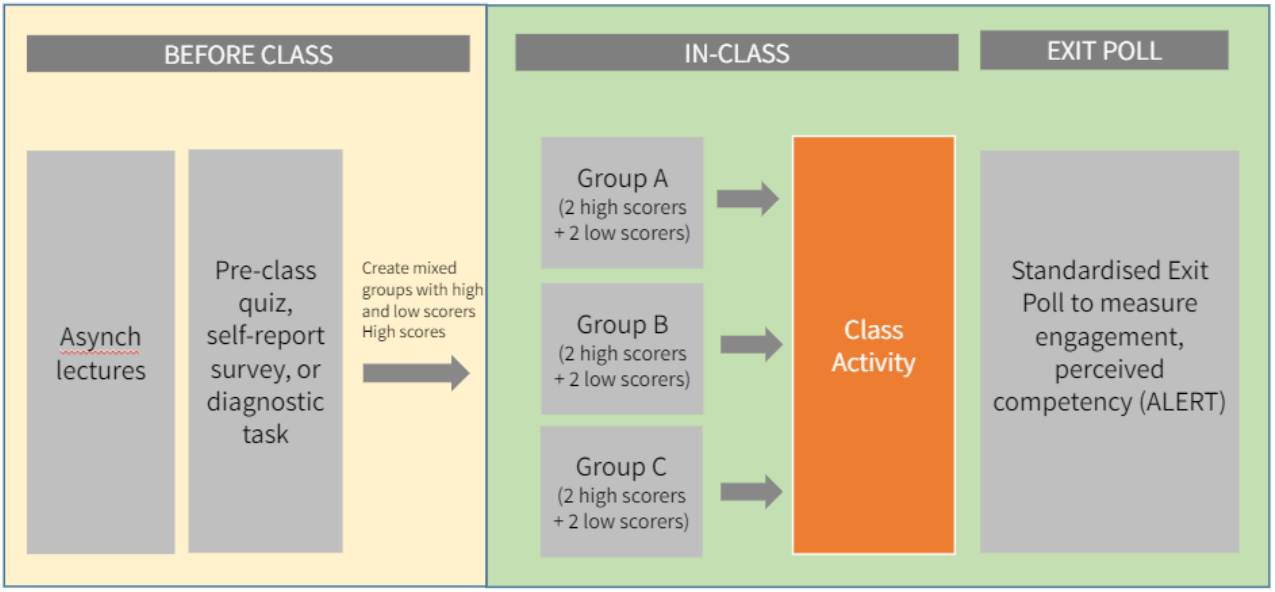
APPENDIX C

Variations of the data-enabled flipped learning model using other DI concepts of learning centres/interest groups and flexible groupings.

Variation of the model using learning stations



Variation of the model using flexible groupings



APPENDIX D

Examples of the pre-class quizzes to assess students' abilities before class.

Question 1 (2 points)

What should you look out for when preparing your data for analysis?

- [ ] Whether there's a need to color-code any responses
- [ ] Whether there's a need to calculate any new variables
- [ ] Whether any questions require a non-alphabetical order of sorting
- [ ] Whether there's a need to create dummy variables

Question 2 (2 points)

When analysing single-select questions, which of the following types of data analysis is the most appropriate?

- ◯ Reporting the averages of each response using pivot tables
- ◯ Reporting the percentages of each response using pivot tables
- ◯ Showing a word cloud
- ◯ Reporting the percentages of each response using COUNTIF

APPENDIX E

Examples of the post-class quiz to assess students' perceptions of the differentiated lessons. These questions were adapted from the Intrinsic Motivation Inventory (IMI, n.d.).

Let me know how has the lesson been for you:

1 - ----------8

Not true at all Very true

#	Statement	1	2	3	4	5	6	7	8
1	I enjoyed today's lesson.	◯	◯	◯	◯	◯	◯	◯	◯
2	This lesson did not hold my attention at all.	◯	◯	◯	◯	◯	◯	◯	◯
3	I thought this lesson was quite enjoyable.	◯	◯	◯	◯	◯	◯	◯	◯
4	After working on the lesson activities for a while, I felt pretty competent.	◯	◯	◯	◯	◯	◯	◯	◯
5	I was pretty skilled at this lesson's activities.	◯	◯	◯	◯	◯	◯	◯	◯
6	This was a lesson that I couldn't do very well.	◯	◯	◯	◯	◯	◯	◯	◯
7	I put a lot of effort into this lesson.	◯	◯	◯	◯	◯	◯	◯	◯
8	I did not try very hard to do well in today's lesson. activities.	◯	◯	◯	◯	◯	◯	◯	◯
9	It was important to me to do well in the activities for this lesson.	◯	◯	◯	◯	◯	◯	◯	◯
10	I believe doing the lesson activities could be beneficial to me.	◯	◯	◯	◯	◯	◯	◯	◯