

INVESTIGATING READINESS FOR REMOTE LEARNING IN THREE COHORTS OF STUDENTS

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The COVID-19 pandemic forced many higher education programmes to be delivered online, with blended learning a viable learning environment in the future. This study investigated differences in readiness for remote learning between three cohorts of students using clustering and thematic analysis. Key classifiers for online distance learning postgraduate learners were motivation to learn, confidence using online tools for learning, and time-management. On-campus learners were motivated to learn and seek assistance but less likely to repeat recorded material and less confident in time-management. On-campus learners were less motivated to learn, less confident in using online tools for communication or to seek assistance, and more likely to mention remote learning's impact on their mental health.

INTRODUCTION

The COVID-19 pandemic has raised major challenges for higher education institutions globally. In particular, many programmes usually delivered face-to-face were required to be delivered online for the 2020–21 academic year. This urgent change was a significant challenge for teaching staff and students. It has been acknowledged that there are differences between the discipline of online and distance learning and the unprecedented move to online instruction. Hodges et al. (2020) formally define the type of instruction being delivered during the pandemic as *emergency remote teaching* and argue that it is important to distinguish between the two so as not to reinforce perceptions that online learning is lower quality than more traditional face-to-face delivery modes. They also point out that it typically takes six to nine months to plan, prepare, and develop a fully online university course, which was clearly an unrealistic time-frame under the circumstances. However, despite these challenges, there has been much discussion around whether this situation may change education forever and if it could be used as an opportunity to change the way we teach going forward.

Despite the extensive research into comparisons between online and traditional teaching methods in statistics (Summers et al., 2005; Ward, 2004) and the readiness for online learning (Hung et al., 2010; Smith, 2000), the current situation is different. Many of these students have not voluntarily opted to study online; nor have the courses been carefully designed to be delivered in this way. This proposal seeks to understand students' readiness for online learning in three cohorts of students. Similar to many higher education institutions, learners from the University of Glasgow can be categorized into three types of learners: on-campus undergraduate (UG), on-campus postgraduate (PGT) and online distance learners (ODL), with the former two cohorts forced to learn remotely due to the COVID-19 pandemic. It was of interest to compare these three cohorts due to perceived differences in learner characteristics and to investigate any differences between voluntary and forced online learning. The novelty within this study lies with identification of distinguishing features between learner cohorts that should inform blended learning environments.

METHODS

The Online Learning Readiness Scale (OLRS) (Hung et al., 2010) was used to determine students' readiness for online learning. The OLRS, which is a validated multidimensional instrument, consists of 18 items on the Likert-scale divided into five validated dimensions: self-directed learning, motivation for learning, computer/Internet self-efficacy, learner control, and online communication self-efficacy (Table 1). Three open response questions were also included to further understand which aspects of online learning students liked/disliked, and if any elements of online learning contributed to performance in the programme. The survey was distributed to students in each cohort during the 2020–2021 academic year and a total of 53 responses were received. Demographic information was also collected as part of this study. The variables measured were gender, age, nationality, employment status, and whether the student had caring responsibilities.

A mixed-methods framework was adopted with clustering and classification methods used to identify groups of students and to identify key features that distinguish cohorts.

Table 1. Summary of 18 Likert scale questions part of the OLRs with descriptors

Question	Label	Descriptor
Self-efficacy	1	Confident performing basic functions
	2	Confident managing software
	3	Confident using the internet
Control	1	Direct own learning progress
	2	Not distracted by online other activities
	3	Repeat online material depending on needs
Communication	1	Confident using online tools to communicate
	2	Confident expressing through text
	3	Confident posting to online discussion
Self-directed	1	Carry out own study plan
	2	I seek assistance when facing learning problems
	3	Manage time well
	4	Set learning goals
	5	High expectations of learning performance
Motivation	1	Open to new ideas
	2	Motivation to learn
	3	Improve from mistakes
	4	Share ideas with others

In order to explore grouping of students, both supervised and unsupervised learning techniques were employed. Classification and regression trees (CART; Izenman, 2013) were used to build a set of rules that classify students into one of the three cohorts, UG, ODL, or PGT, depending on responses to the 18 items on the Likert-scale as part of the OLRs. Decision rules were iteratively implemented using the 18 items beginning with the item with the ‘highest’ association to cohort (that is the variable of interest).

K-medoid clustering (Izenman, 2013) was used as an unsupervised approach to cluster students based on their responses to the 18 items. This algorithm aims to partition observations around medoids that are representative observations. Each observation is assigned to the closest medoid depending on a pre-defined distance or dissimilarity measure. We opted to measure dissimilarity through Gower distance, given the nominal nature of the 18 items. Gower’s distance between two students is the number of times the two students’ responses match relative to the number total number of items (18 in this case). If the two students’ responses match on all items, then the Gower distance is 1 and if the two students’ responses differ on all items, then their Gower distance is 0. In order to choose the number of clusters, the average silhouette method was used. The silhouette width of an observation is the difference between the average distance from the observations and observations in the nearest cluster and the average distance from the observation and observations in the same cluster. The maximum silhouette width provides the clustering for which observations within a cluster are closer to each other than their nearest cluster.

For each of the three open questions asked, thematic analysis was used to identify key themes. Categories were identified based on descriptive coding and then collated into meaningful themes (Saldana, 2021).

RESULTS

Classification and Clustering Analyses

Classification results are presented in Figure 1(a). The first splitting rule depends on ‘Motivation2’ (see Table 1) with the ODL learners forming the majority of strongly agreeing responses (Motivation2 = 5) and PGT learners forming the majority of somewhat agreeing and neutral responses (Motivation2 = 4 and 3, respectively). The second splitting rule depends on ‘Communication1’ (Table 1) with the ODL learners forming the majority of somewhat and strongly agreeing responses (Communication1 = 4 and 5, respectively). Managing time (Self-directed Learning3) distinguishes ODL

from PGT learners, with ODL learners forming the majority of neutral, somewhat, and strongly agreeing responses (Self-directed Learning3 = 3, 4 and 5, respectively).

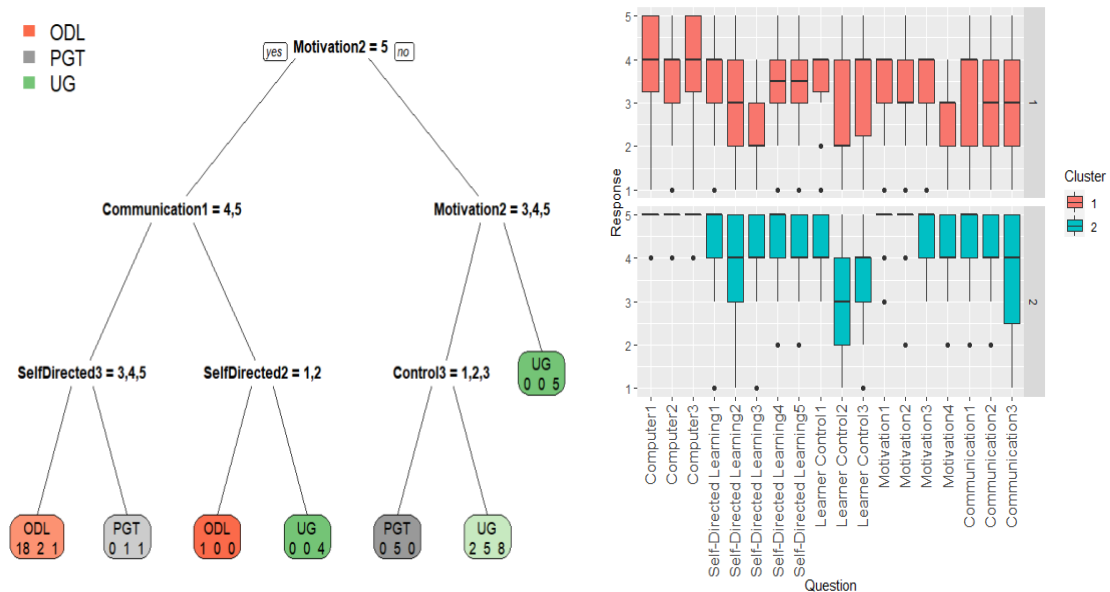


Figure 1. (a) Decisions tree of depth 3 splitting rules depending on motivation, communication, and self-directed learning to classify the three cohorts of students (ODL, PGT and UGT) (b) Boxplots of the 18 Likert-scale questions (see Table1) separated by cluster resulting from K-medoids clustering

Clustering results suggest two clusters to be optimal, with Cluster 1 comprised of 18 students (56% UG, 39% PGT, and 6% ODL) and Cluster 2 comprised of 35 students (57% UG, 17% PGT, and 26% ODL). Figure 1(b) shows boxplots corresponding to each of the 18 items separated by cluster. The main distinctions between the two clusters, other than cohort, are centered around self-directed learning and motivation, with Cluster 2 students on average strongly agreeing with managing time well, setting learning goals, and setting higher expectations (Self-Directed Learning 3, 4, and 5, see Table 1), being open to new ideas, motivation to learn, improve from mistakes, and sharing ideas (Motivation 1, 2, 3, and 4, see Table 1).

Theme 1—Learning and Teaching

Students from the three cohorts identified several benefits to remote learning, including the use of recorded materials to improve and reinforce understanding, detailed handouts, and more opportunities for open book assessments. On the other hand, students referred to teaching standards and quality more so in response to the question ‘What aspect of online learning did you dislike.’ Discussion centered around a perceived lower standard of teaching and more challenging assessments, although students did perceive open-book assessments to be advantageous. Most cohorts identified the benefit of the convenience and accessible nature of online learning materials, the lack of direct contact with lecturing staff and other students played a prominent role in students being able to interact with the material. Students commented on the unengaging nature of pre-recorded material and difficulty in breaking down material independently. The reward of learning in a higher education setting in comparison to learning from books and other resources was somewhat lost.

Theme 2—Interaction

The overarching comment surrounding interaction in a remote environment was the lack of community. Students noted the lack of engagement and community among their peers and with lecturers. Several students noted that speaking over Zoom, which is the more commonly preferred mode of delivery for live synchronous lectures among staff, was uncomfortable. This in turn created an additional barrier for some students to ask for additional clarifications or explanations on concepts covered in the learning material.

Theme 3—Learning Management

Students enjoyed the flexibility and control of remote learning, where they could work to their own preferences and use the material and recorded lectures as study aides to suit their individual needs. This provided a level of freedom that may not otherwise exist. This required a level of time management and a perceived motivation and focus to learn independently.

Theme 4—Wellbeing

Students commented on the negative impact of remote learning on their mental health. Students perceived remote assessment to be more challenging than what they may have expected under usual on-campus invigilated assessments, which created additional exam pressures in a more isolated environment.

DISCUSSION

Generally, all three cohorts identified a benefit to the flexibility with remote learning. This highlighted the advantage of working at their own pace, accessing asynchronous material, and using the recorded material to aid their studies.

UG learners seemed more invested in the standard of the learning material provided and were more likely to rely on this material to prepare for assessments. They took advantage of saving time travelling to lectures and working at their own pace. The overwhelming message from UG learners was the impact on mental health. Only UG students commented on feeling anxious or stressed and the impact of remote learning on their wellbeing. UG learners were more likely to comment on a lower standard of learning material and the lack of structure and preparation on the part of the lecturer and suggested the need for additional material. There was an implication that UG students were more reliant on learning material in comparison to the other cohorts. The isolation and lack of interaction may have played a vital role in UG learners becoming overly reliant on learning material. UG students were less likely to ask for help or perhaps did not know how to ask for help in a remote environment. Therefore, if a UG learner did not understand material, then they seemed unable to develop their knowledge through discussion or further reading. PGT learners highlighted their preference for live lectures and a variety of learning methods. Like UG learners, PGT learners were more unmotivated to learn in a remote environment.

Given the demographics of ODL learners, the flexibility of remote learning allowed ODL learners to work and learn simultaneously. ODL students were more likely to be international and live in a different time zone. ODL students seemed more able to use the flexibility of remote learning to their benefit. It may be the case that because ODL students were more likely to have full-time employment, then they were perhaps not so reliant on course lectures and learning materials in comparison to the other cohorts, although all three cohorts did note a lack of engagement and interaction.

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