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Navigating the uncertainty: the impact of a student-centered final year project allocation mechanism on student performance

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The Final Year Project (FYP) is one of the most important courses for every undergraduate student, and the effective operation of the FYPs in higher education still faces challenges, such as uneven resource distribution and limited efficiency. This study reports a mixed-methods approach to study the impact of a student-centered FYP allocation mechanism on student performance. This research aims to investigate how aligning students' FYP choices with their interests can inspire motivation and enhance academic performance. More importantly, this mechanism improves students' academic resilience, enabling them to navigate unexpected contextual factors. The study's findings take into account various aspects, including student satisfaction with the allocation process, future improvement methods, and the relationship between interest and context. The outcomes observed in this study support our hypotheses, indicating the improvements in students' academic performance as well as the pass and completion rates. Moreover, this research contributes to 'resilience theory' by exploring students' adaptability to contextual changes and their enhancement of academic resilience. This study proposes recommendations for cultivating a dynamic student-centered classroom environment. Future work could pay attention to addressing the limitations of this study, exploring other factors influencing FYP allocation, and integrating more quantitative measures for a comprehensive assessment of its impact.

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Introduction

Final Year Project (FYP) is a key milestone in undergraduate programs at universities, playing an essential role in awarding four-year degrees (Hussain et al., 2019; Mateo et al., 2012; Thambyah, 2011). Over a year, students are tasked with applying their professional expertise and integrating many skills, including project management, problem-solving, report writing, and presentation, to complete their FYPs (Hunter et al., 2007). Furthermore, the FYP serves as a bridge for undergraduate students to transition into research and develop professional skills, potentially helping them enter postgraduate education or join companies (Teo and Ho, 1998).

Successful FYP operations are also instrumental for the universities, which can enhance the overall quality of undergraduate education and facilitate closer integration with postgraduate programs (Hunter et al. 2007). However, students in FYP often face challenges, including limited independent research experience and time, lack of interest in assigned projects, and resource constraints for supervisors and projects (Cook, 1980; Lovitts, 2005; Rowley and Slack, 2004). Moreover, unexpected contextual changes, such as the COVID-19 pandemic, introduce uncertainty, ambiguity, complexity, and changeability (UACC), also potentially limiting the continuous and effective operation of FYPs (Li et al., 2022).

In this context, the FYP allocation mechanism is one of the most crucial factors influencing students' self-motivation, research interest, and engagement (Hussain et al., 2019). Aligning with students' interest and their active engagement contributes positively to the advancement of the project (Barber and Timchenko, 2011; Kuh, 2009; Wang et al., 2014; Zhu et al., 2022). However, existing FYP allocation mechanisms do not sufficiently consider students' interests and fairness, which may result in limited motivation and adaptability to contextual changes (I'Anson and Smith, 2004; Salami and Mamman, 2016).

Therefore, this study proposes a student-centered FYP allocation mechanism to prioritize students' interests and the fairness of the allocation process. Through a mixed-methods case study at an international university spanning three academic years (AYs), we collected and analyzed FYP data from our School of Advanced Technology (SAT) on an online education platform. We aim to explore the impact of our mechanism on students' academic performance and resilience before and after the implementation of this allocation mechanism. In the future, we also aim to extend the applicability of this study to other project-based learning contexts in higher education by performing more student-centered designs. This may enhance students' academic resilience and drive university transformation in the post-pandemic UACC era.

Literature review and research questions

The COVID-19 pandemic has impacted various aspects of higher education, including teaching, learning methods and FYP allocation mechanisms. This global crisis has prompted universities to shift towards remote learning and online education, gradually changing the traditional educational landscape (McCormack et al., 2021).

Before the pandemic, universities primarily followed a teacher-centered model, employing curriculum systems and mechanisms, such as question-and-answer sessions and teacher-assigned FYPs. However, the pandemic accelerated educational institutions' adaptation to online environments and digital teaching methods, such as flipped classrooms (Zhu et al., 2022). This change has redefined teaching models and roles, potentially encouraging higher education institutions to improve online teaching efficiency and foster students' resilience (McCormack et al., 2021).

Meanwhile, universities are shifting towards interest-oriented and student-centered mechanisms to address the challenges presented by changes in knowledge dissemination approaches (Greener, 2020). As one step in allocating research resources, improvements in the FYP allocation mechanism may assist universities in transitioning from knowledge dissemination to research-led instruction (Li et al., 2021). Therefore, in the process of improving the FYP allocation mechanism, there is a need to prioritize students' interests, ensure fairness, and align FYP operations with university transformations and the post-pandemic UACC era.

Student-centered FYP allocation mechanism. Traditional FYP allocation mechanisms, especially supervisor-centered approaches, face various challenges. These supervisor-centered methods often involve supervisors selecting students based on personal preferences or communicating with students after publishing FYP abstracts (Hussain et al., 2019). However, these methods raised concerns about fairness and inefficiency due to the introduction of subjective judgments.

To address these challenges, researchers and educational institutions are exploring more inclusive and efficient methods to replace traditional supervisor-centered methods. Many student-centered FYP allocation mechanisms were proposed to consider students' needs and preferences while enhancing fairness and students' engagement (Bakar et al., 2013; Calvo-Serrano et al., 2017; Hasan et al., 2009). However, these student-centered approaches also have some limitations. For example, relying solely on students to propose FYPs may encounter challenges related to project feasibility (Chang, 2005; Hidi and Renninger, 2006). Additionally, while the application of automation techniques in FYP allocation provides transparency and efficiency in resource allocation, they also raise concerns about fairness and resilience (Hussain et al., 2019). Hence, this study aims to establish a new student-centered automated FYP allocation mechanism to address these issues and consider student performance.

As part of our study on the impact of our student-centered FYP allocation mechanism, we proposed the following two research questions (RQs):

RQ1: How satisfied are the students with our FYP allocation mechanism?

RQ2: How will the FYP allocation mechanism be improved in the future?

Satisfaction is measured by the percentage of students who successfully obtained their preferred FYPs before or during the first allocation round.

Interest and context. Interest, stemming from personal curiosities and passions, is commonly recognized as a powerful driver of engagement and motivation within educational settings (Hidi and Renninger, 2006). When students have the opportunity to pursue subjects aligned with their interests, they tend to exhibit stronger self-motivation, resilience, and academic performance (Renninger et al., 2019; Sansone and Smith, 2000). Recognizing this, we need to consider the levels of student interest during the FYP allocation process.

In this study, the context mainly involves the academic system of higher education institutions and the social background. The academic system, including pedagogy and resource allocation, may influence students' learning experiences and motivation (Hulleman and Harackiewicz, 2009; McNeal, 2015; Renninger and Hidi, 2011). Furthermore, the social background, particularly in the post-pandemic UACC era, introduces external factors that

could impact students' psychological well-being and academic performance. For instance, the prolonged absence of peer interactions may be one of the important reasons (McCormack et al., 2021; Tai et al., 2019).

Within our FYP allocation mechanism, given the impact of these factors on student's performance, we proposed the *RQ3* and the following hypotheses (Hs):

RQ3: How do interest and context influence students' academic performance (FYP scores)?

H1: Interest has a positive relation with students' academic performance.

H2: Specific contextual factors, such as the student-centered allocation mechanism, have a positive relation with students' academic performance.

Academic resilience. Based on resilience theory and related research (Caruana, 2014; Martin and Marsh, 2008; Van Breda, 2001), academic resilience is explained as the ability of students to navigate challenges and achieve success in higher education, including recovering from setbacks and utilizing strengths to develop. Moreover, academic resilience involves a dynamic interaction between students and the academic system, enabling positive adaptation to environmental pressures (Choi et al., 2014; Friborg et al., 2003; Morrison and Allen, 2007; Tugade et al., 2004). This provides a theoretical framework for designing our student-centered FYP allocation mechanism to potentially enhance students' performance.

In the post-pandemic UACC era, digital learning and intensified peer competition lead to increased student stress and emotional strain. The changes in traditional learning models underscore the need to extend resilience theory in the current context. Recently, some studies indicated that academic resilience may help students in adapting to blended learning environments, regaining motivation, or enhancing engagement (Brewer et al., 2022; Hidayah and Morganna, 2022; Zhu et al., 2022). Therefore, our study aims to extend the application of academic resilience to more specific impacts within FYP allocation mechanisms, such as pass rates, completion rates, and changes in academic scores.

Experimental methods

In this study, we conducted a three-year mixed-methods case study at a Sino-British, English-medium instruction international university (the University) in China. During AY2020-2021, the University employed a traditional supervisor-centered manual FYP allocation mechanism. In the subsequent AY2021-2022 and AY2022-2023, our proposed student-centered automated FYP allocation mechanism was utilized for all SAT students at the University. The study focused on investigating the impact of our mechanism on students' academic performance.

Design of the FYP allocation mechanism. Our FYP allocation mechanism begins by gathering all available FYPs, primarily sourced from supervisors, onto an online platform. Then, the mechanism employs a four-step student-centered automated project allocation, as shown in Fig. 1.

In the first step, several specific projects are assigned to a limited number of eligible students designated by their supervisors. These students include undergraduate research assistants and summer research students. This step serves to ensure fairness for "early bird" students who have engaged in specific projects from their early undergraduate years and seek to secure them. Meanwhile, remaining students also have more opportunities to obtain popular FYPs, which were highly likely to be obtained by "early bird" students in the previous allocation mechanism. Furthermore, our mechanism empowers supervisors to assign individuals to projects, provided that the students meet the criteria defined by the school learning and teaching committee. This criterion aims to safeguard the feasibility of the FYPs and facilitates effective supervision.

In the second step, most projects, including popular ones, are accessible to the remaining students, excluding those pre-allocated in the first step. Students gain access to comprehensive project information through the online project option pool, which aims to mitigate biased allocation linked to project or supervisor popularity.

In the third step, students have the opportunity to rank up to ten FYP choices based on their personal preferences. This approach aims to align with individual interests and enhance satisfaction with the allocation process. Additionally, stronger interest preferences enhance the likelihood of being assigned to a preferred project. For instance, students designating Project A as their 1st choice are more apt to obtain it than those designating it as their 2nd choice based on the developed allocation computer algorithm.

In the final step, the module leader oversees the platform system, using an algorithm to randomly allocate projects to students who share the same choice ranking for a specific project. For example, if Project A is highly popular, with ten students ranking it as their 1st choice, the algorithm will randomly assign one student to receive this project. Subsequently, the process moves on to consider the 2nd choice of the remaining students, and this process is repeated until each student is assigned to a different project.

Data collection and sample selection. The required data for this study were obtained from the University's online platform. The study focused on three consecutive AYs: 2020-2021, 2021-2022, and 2022-2023. Within these AYs, our research sample comprised fourth-year undergraduate students majoring in engineering disciplines from the SAT. The FYPs for these students took place from September of the current year to May of the following year. Throughout these AYs, the University consistently admitted Tier-1 students with similar scores in the Chinese National College Entrance Examination (Gao Kao) without significant score variations or special exemptions. Previous studies have indicated that Gao Kao scores can predict undergraduate academic performance to some extent (Zhu et al. 2022), making the comparison of these students across different AYs suitable for our study.

During the sample selection, we considered students' willingness and availability. All registered undergraduates were invited to voluntarily and anonymously complete a brief online questionnaire, which took approximately five minutes. Before proceeding, the questionnaire emphasized reading and confirming the online consent form and participant information sheet. Participants were informed of their right to withdraw from the study at any point. Additionally, the questionnaire did not impact students' final FYP scores. We selected students willing to participate in the study and utilized our student-centered allocation mechanism on the online platform. Finally, all registered students from the three AYs responded to the questionnaire, achieving a 100% response rate. This sample selection process aims to ensure that we obtained representative student data, providing a foundation for our analysis of the FYP allocation mechanism.

Although the backgrounds, project availability, and research interests of supervisors may lead to different numbers of proposed FYPs, we have set the minimum proposed number of each supervisor to ensure that all supervisors are selectable. The University ensured the supply of FYPs, meeting or exceeding the

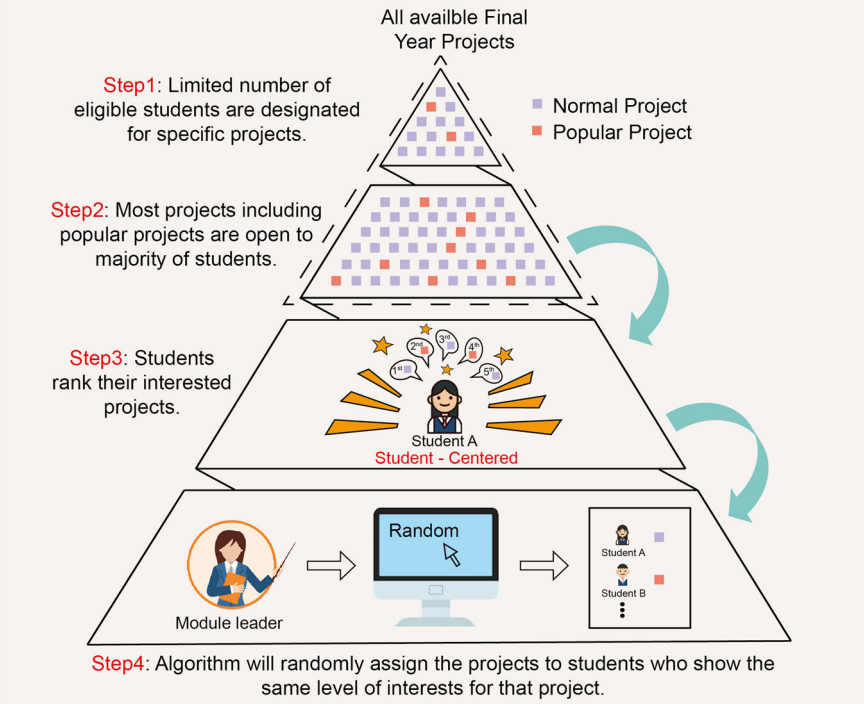

Fig. 1 The flow chart of the proposed student-centered FYP allocation mechanism design. The whole process consists of four steps.

Table 1 *Samples* 1–3 participant descriptive information.

	Supervisor-centered allocation mechanism	Student-centered allocation mechanism	
Number	**Sample 1 (AY2020-2021)**	**Sample 2 (AY2021-2022)**	**Sample 3 (AY2022-2023)**
Supervisors	56	84	80
FYPs	246	636	692
Students	246	558	474
Pre-allocated	NA	89	146
Round 1	NA	425	289
Round 2	NA	35	20
Round 3	NA	NA	9
Non-selected	NA	9	10

number of students within an AY, thus ensuring that each student could undertake a different project. We divided the collected data into three distinct samples (*Samples* 1, 2, and 3) based on the AYs. Table 1 offers an overview of the three samples, including supervisor counts, FYP numbers, student totals, and allocations per round (Round 1–3).

Meanwhile, FYP scores for students across the three AYs were collected. These scores resulted from evaluations at various FYP stages, including interim progress assessments (25%), project demonstrations (15%), and the final dissertation (60%). Supervisors conducted these assessments, offering valuable insights into students' progress, achievements, and overall performance. The final dissertation carries the highest weightage, representing the comprehensive assessment of the FYP. Additionally, we gathered data regarding students who either did not complete their FYPs (non-submitted students) or failed in their FYPs. This information facilitated the analysis and identification of challenges encountered by students during the FYP process.

We also collected insights from an online questionnaire with open-ended questions, which was completed by students from *Sample* 2. This questionnaire aims to capture students' perspectives on improving our FYP allocation mechanism following its first year of implementation (AY2021-2022). The questionnaire includes topics related to the perceived project suitability and satisfaction with the allocation process. We designed the questionnaire to be as concise as possible to maintain respondents' focus within a short period (Al-Adwan et al., 2023). Sufficient time was allocated for students to complete it, and reminders were sent to encourage participation. Upon collection, the responses were methodically collated and analyzed to extract meaningful insights into students' viewpoints and experiences concerning our mechanism (Artino et al., 2014). Results regarding satisfaction are presented in the Sect. "Results", while some suggestions for improvement are summarized and described in the Sect. "Recommendations".

Data analysis. The data collected experienced a meticulous processing and analysis phase utilizing MATLAB (MathWorks Inc). Data cleaning and review procedures were implemented, involving cross-checking between the online platform and written records to identify and rectify potential errors or inconsistencies.

A normality test was performed to assess the distribution of data for normality. Since the data did not meet the assumptions of normal distribution, non-parametric tests were selected for further analysis (Zhu et al., 2022). Specifically, the

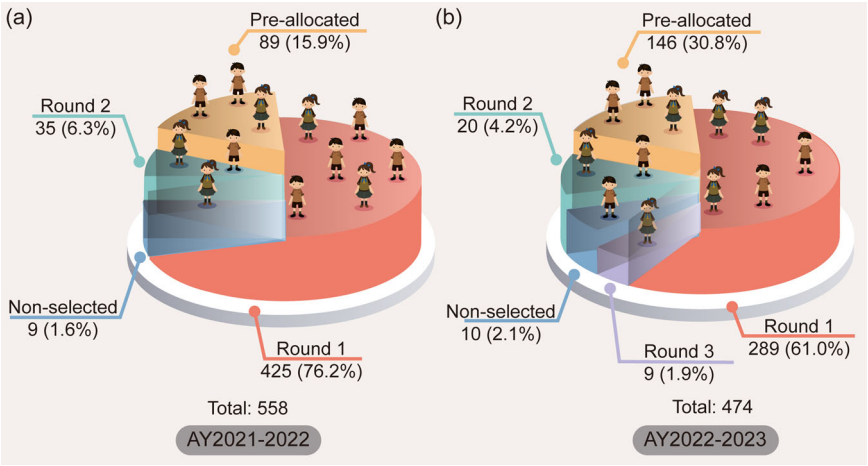

Fig. 2 The number of students per automated allocation round in the student-centered FYP allocation mechanism. a The number of students allocated in AY2021-2022. **b** The number of students allocated in AY2022-2023.

Mann–Whitney U-test was employed to compare the average FYP scores of undergraduates under both allocation mechanisms in light of the deviation from normality (MacFarland and Yates, 2016). A significance level of 0.05 was chosen to address *RQ3* and evaluate *H1* and *H2*. Additionally, the study calculated the failure rate, which represents the proportion of students with final FYP scores below 40, as well as the non-submission rate, presenting the proportion of students who did not complete some or all of their FYPs. These data processing and analysis methods were used for statistical comparisons to assess the performance of both allocation mechanisms (supervisor-centered and student-centered) and their impacts on students.

By integrating data from various assessment components, we aim to evaluate the effectiveness of our FYP allocation mechanism, identify opportunities for enhancement, and provide recommendations to improve the overall FYP experience.

Results

Satisfaction with the mechanism and directions for improvement. We utilized data collected from the online platform and the questionnaire feedback to answer *RQ1* and *RQ2*. This focuses on students' satisfaction with our FYP allocation mechanism and the potential directions for its improvement.

Our student-centered FYP allocation mechanism aims to enhance its effectiveness and fairness by ensuring that the majority of students are allocated their preferred FYPs (Al-Adwan et al., 2023; Li et al., 2021). We used pie charts to illustrate the allocation results for *Sample* 2 and *Sample* 3 based on students' preferences, as shown in Fig. 2a, b, respectively. After the first allocation round (Round 1), 92.1% and 91.8% of registered students obtained their preferred projects in AY2021-2022 and AY2022-2023, respectively. After Round 2 and Round 3, only a small percentage of students (1.6% and 2.1%, respectively) did not obtain their preferred FYPs. Although the majority of students received their preferred FYPs, we also noted the needs of those students who did not select FYPs. Therefore, the module leader manually allocated FYPs to non-selected students to prevent them from falling behind.

To further evaluate the satisfaction with the mechanism and enhance the student learning experience, we applied a feedback assessment strategy. Utilizing survey questionnaires, we systematically collected feedback from participants in *Sample* 2, providing them with a platform to voice their opinions, recommendations, and concerns. With the response rate of 95.3% (532 out of 558 registered students), active participation presents students' engagement and motivation to improve the FYP allocation process. Among these respondents, 85.3% (454 students out of 532 respondents) expressed their satisfaction with our allocation mechanism and supported its continuity. Besides, 6.2% (33 students out of 532 respondents) raised concerns about the diversity of options provided by the allocation mechanism. Furthermore, 8.5% (45 students out of 532 respondents) contributed their suggestions aimed at advancing our mechanism further. These insights are described in Sect. "Limitations and future development" after consideration. Overall, the student feedback evaluation showed positive results and helped us to improve our mechanism continuously.

Hypothesis testing. To delve into *RQ3*, which investigates the impact of interest and context on students' academic performance (FYP scores), we conducted a series of tests to examine the relationships outlined in *H1* and *H2*.

We first grouped students based on the priority of FYPs they obtained: 'pre-allocated', '1st choice', '2nd and 3rd choices', '4th and 5th choices', and 'others'. The boxplots illustrate the final FYP scores of these groups during AY2021-2022 (Fig. 3a) and AY2022-2023 (Fig. 3b). This grouping was defined as follows: 'pre-allocated' group consists of "early bird" students who meet the specific conditions mentioned above, and the '1st choice' group obtained their highest-priority FYPs. Additionally, the 2nd and 3rd choices were grouped due to their similarity in preferred interests, as well as for the '4th and 5th choices' group. The remaining students who obtained low-priority FYPs were classified as the 'others' group due to their smaller size. This grouping rationale was applied to ensure that there were a sufficient number of students in each group for analysis and comparison (Cox, 1957). We aim to reduce the complexity of the analysis while still capturing the core of students' interest choices, especially considering that '2nd and 3rd choices' and '4th and 5th choices' were relatively less preferred than '1st choice'. This approach allowed us to focus on the variations between different interest priorities while maintaining statistical reliability in our results.

The 'pre-allocated' group exhibited better performance compared to other groups across multiple quantitative metrics. During AY2021-2022, the 'pre-allocated' group outperformed the '1st choice' group with a 10.3% higher median score, an 11.3% higher 25th percentile score, and a 6.8% higher 75th percentile score. During AY2022-2023, compared to the '1st choice' group, the 'pre-allocated' group had a 17.3% higher average score, an

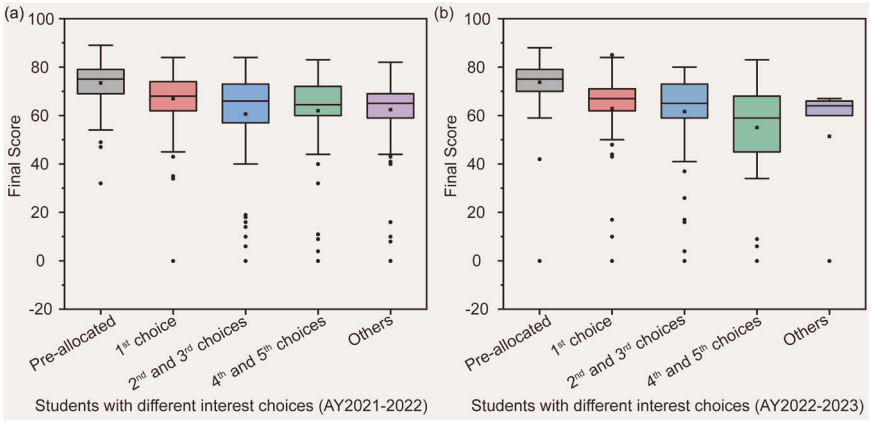

Fig. 3 Final FYP scores for students with different interest choices across two AYs under the student-centered allocation mechanism. a Boxplots of students' final FYP scores during AY2021-2022 and (**b**) during AY2022-2023.

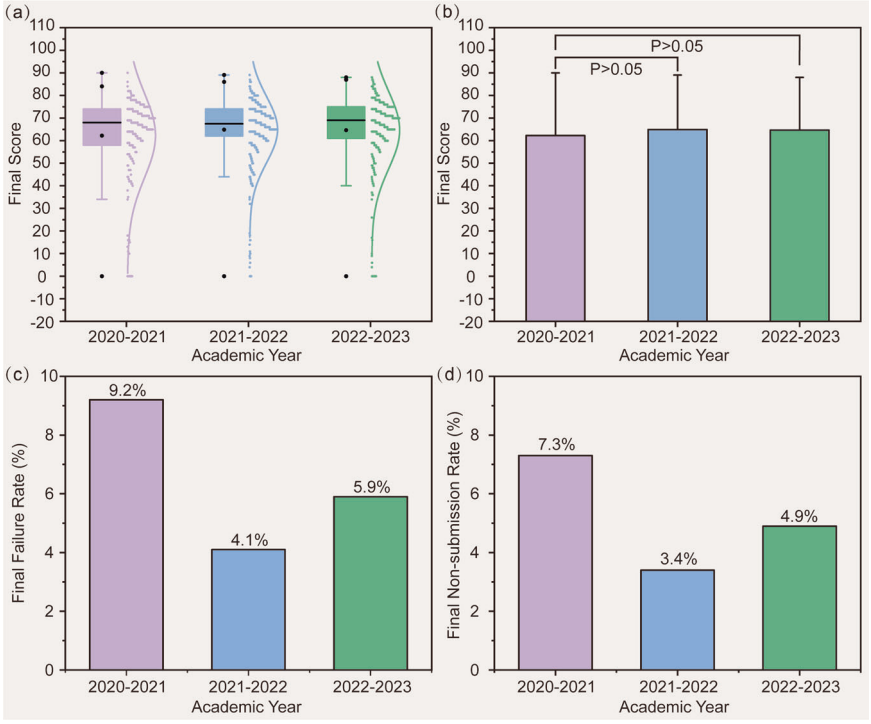

Fig. 4 Students' final FYP scores, failure and non-submission rates under supervisor-centered allocation (AY2020-2021) and student-centered allocation mechanisms (AY2021-2022 and AY2022-2023). a Boxplots of the final FYP scores for both mechanisms. In the box, the middle black bar is the median; the bottom and top bars are the 25th and 75th percentiles, respectively. The normal distribution fitting of the data set is also shown along the right side of the boxes. **b** Average final FYP scores. **c** Final FYP failure rate. **d** Final FYP non-submission rate.

11.9% higher median score, a 12.9% higher 25th percentile score, and an 11.3% higher 75th percentile score. Moreover, stronger academic performance was generally associated with stronger interest, except in the 'others group', thereby confirming *H1*.

When validating *H2*, we considered the two contextual factors: academic system (allocation mechanism) and social background (McCormack et al., 2021; McNeal, 2015). Students' final FYP scores are regarded as the indicators of academic performance (Mateo et al., 2012). Figure 4a displays the distribution of final FYP scores under two different allocation mechanisms across three AYs. The findings show that students allocated through our mechanism exhibited higher FYP scores than students assigned via the supervisor-centered mechanism across several quantitative metrics. Specifically, during AYs 2021–2023, our mechanism showed an improvement of 4.2% and 3.9% in average final FYP scores compared to the previous supervisor-centered mechanism. Furthermore, the 25th percentile scores increased by 6.9% and 5.6%, respectively. To assess the relationship between the allocation mechanism and final FYP scores, we conducted the Mann-Whitney U-test. As shown in Fig. 4b, the calculated p-values for comparing average scores were 0.4121 and 0.1111. Although the p-values exceeded the significance threshold of 0.05, there was still an improvement in scores. Limitations and possible future improvements will be discussed later.

Additionally, our study considered two measures of academic performance: the failure rate and the non-submission rate, which are related to students' academic resilience (Casinillo, 2019; Finn and Rock, 1997; McMillan and Reed, 1994; Salazar-Fernandez et

al., 2019). As illustrated in Fig. 4c, d, our mechanism reduced the failure rate by 5.1% and 3.3%, and the non-submission rate by 3.9% and 2.4%, respectively, compared to the supervisor-centered mechanism.

During the three AYs of our study, students faced campus lockdowns due to the COVID-19 pandemic while completing their dissertations in AYs 2020-2022 and engaged with our mechanism in AYs 2021-2023, as detailed in Table 2. This special context formation provides us with an opportunity to understand the impact of different contexts by analyzing variances in dissertation scores.

Figure 5a demonstrates that our mechanism performed higher students' dissertation scores compared to the supervisor-centered mechanism across certain quantitative measures. Specifically, our mechanism resulted in an average improvement of 4.9% and 5.3% in dissertation scores during AY2021-2022 and AY2022-2023, accompanied by respective increases of 3.4% and 5.1% in the 25th percentile scores. To evaluate the relationship between the allocation mechanism and dissertation scores, we applied the Mann-Whitney U-test. Figure 5b shows the obtained p-values for comparing average scores as 0.3746 and 0.1067. Our mechanism reduced the failure rate by 3.8% and 3.7%, and the non-submission rate by 3.9% and 3.1% compared to the supervisor-centered mechanism, as shown in Fig. 5c, d.

These findings, to some extent, indicate that our student-centered mechanism positively influenced students' academic performance during the pandemic and in the post-pandemic UACC era. By investigating two specific contextual factors, namely the academic system and the social background, our research substantiates *H2*.

Discussion

In this study, we investigated the impact of our student-centered FYP allocation mechanism on students' performance. This research provides practical insights and contributes to the theoretical understanding of interest, context and academic resilience. We conducted this study during the COVID-19 pandemic and the post-pandemic UACC era, considering the challenges students faced, such as the transition to blended learning (Li et al., 2022). The research findings addressed three RQs and confirmed two Hs.

Theoretical implications. Our student-centered allocation mechanism enhances students' intrinsic learning motivation by aligning students' interests with their FYPs. This point can be explained by the cognitive evaluation theory (Deci and Ryan, 1985; Ryan et al., 1983), which suggests that the context can either enhance or diminish intrinsic motivation. Moreover, our allocation mechanism empowered students to take charge of their learning process by allowing them to select FYPs, which may enhance autonomy to improve their academic performance. This finding aligns with some studies that demonstrated supporting students' autonomy positively affects their engagement and achievement (Grolnick and Ryan, 1987; Reeve and Jang, 2006; Vansteenkiste et al., 2004). Furthermore, our study indicates that students allocated to their preferred FYPs performed better and

Table 2 Contexts of AY2020-2023, including academic system and social background.

	AY2020-2021	AY2021-2022	AY2022-2023
Academic system	Supervisor-centered allocation mechanism	Student-centered allocation mechanism	Student-centered allocation mechanism
Social background	Pandemic era	Pandemic era	Post-pandemic era

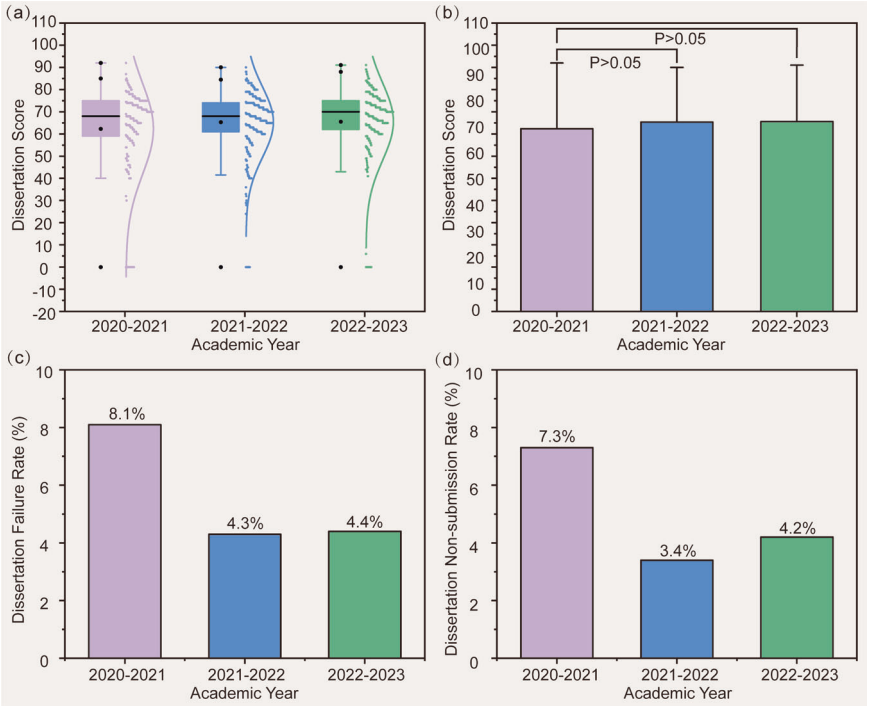

Fig. 5 Students' dissertation scores, failure and non-submission rates under supervisor-centered allocation (AY2020-2021) and student-centered allocation mechanisms (AY2021-2022 and AY2022-2023). a Boxplots of the FYP dissertation scores for both mechanisms. **b** Average FYP dissertation scores. **c** FYP dissertation failure rate. **d** FYP dissertation non-submission rate.

exhibited greater resilience in the face of challenges, such as the COVID-19 pandemic and the shift to blended learning. This finding supports the extension of resilience theory to the student-centered design of project-based resource allocation mechanisms (Van Breda, 2001), which may enhance students' adaptability to changes in context.

Practical implications. Our study offers practical insights for enhancing students' performance and academic resilience in higher education. Our study shows the importance of aligning professional practices with students' interests. In our mechanism, students obtained FYPs that are self-selected, which empowers students to set goals, fostering motivation, self-confidence, and reflective thinking (Ainley et al. 2002; Bonyadi and Zeinalpur, 2014; Hoffman and Schraw, 2009; Pajares and Graham, 1999). This design also trains students' ability to tackle complex tasks and enhance their academic resilience, such as recovering faster from stage failure (progress assessment of FYPs) (Choi et al. 2014; Stajkovic and Luthans, 1998).

Limitations and future development

Although this study addressed some RQs, there are still limitations and areas for future improvement. First, this study may not fully capture the workload and attitudinal shifts experienced by supervisors. Acknowledging the impact of supervisors in guiding and evaluating FYPs, there is a need to consider the challenges they face within the existing allocation framework. Additionally, due to the potential control over the proportion of high-scoring individuals, the grading by supervisors may have influenced the more significant improvement in scores under the student-centered allocation mechanism to some extent. Therefore, beyond evaluating the impact on students, future enhancements in allocation methods should involve evaluating and balancing supervisors' workload distribution, attitudes, and perspectives. For example, this may involve establishing effective relationships between supervisors and students, understanding supervisors' expectations from students, and tracking changes in attitudes during progress assessment (Reguant et al., 2018). Utilizing tools like Likert scales or conducting focus group interviews could facilitate this analysis. These improvements might assist supervisors in meeting students' needs and managing their workload efficiently within the student-centered allocation mechanism, considering various factors such as individual characteristics and knowledge levels (Todd et al., 2006).

Second, there are limitations concerning the scale of the study group and the transferability of research outcomes. This study was conducted among undergraduate students within a specific school (SAT), potentially reflecting particular demographic characteristics. Future research might consider diversifying across different degrees, universities, or countries to broaden the study's scope. Moreover, future research might consider the potential influence of individual and group factors such as students' majors, gender, and personality traits on the execution of FYPs. For instance, in engineering education, there tends to be a higher proportion of male students than female students (Zhu et al., 2022). A focused exploration into gender could reveal varying preferences between male and female students in project selection (Kamphorst et al., 2015; Tătar et al., 2023). By analyzing these factors, future research might understand whether specific personality traits drive preferences for particular project types or influence the quality of project outcomes (Li et al., 2022).

Finally, although our study indicates an improvement in students' academic performance, it is limited to within the FYP period. Specifically, exploring whether the FYP under this allocation mechanism contributes to enhancing graduates' prospects warrants attention (Scott et al. 2019; Serbic and Bourne, 2020). Therefore, future research could involve surveying graduates' destinations to study the relationship between academic training and employability. By addressing these limitations and pursuing these future developments, we might further enhance the effectiveness, fairness, and overall impact of the FYP allocation mechanism, promoting students' success and enriching the educational experience for all stakeholders.

Recommendations

Based on the findings of this study, several recommendations can be made to enhance the student-centered FYP allocation mechanism further and improve the supervision of FYPs.

First, foster a student-centered environment: Teachers could utilize the student-centered allocation mechanism and interactive learning materials that prioritize students' interests, enhancing students' academic resilience and encouraging active participation in the FYP process.

Second, maintain a balance between strictness and flexibility: while adhering to the rules and guidelines of the FYP allocation mechanism, supervisors need to offer students support materials and detailed project descriptions before the allocation process begins. However, if students find their assigned project unsuitable, reasonable adjustments within a specific range should be considered to ensure a better fit and accessibility for students.

Finally, embrace continuous improvement: The FYP allocation mechanism should be viewed as a dynamic process that can be optimized by regular evaluation and feedback from students and supervisors.

Conclusion

In conclusion, this study demonstrates the impact of our student-centered FYP allocation mechanism on students' performance and academic resilience by prioritizing the relationship between interest and context in the design of the mechanism. The research findings indicate a positive impact of the FYP allocation mechanism on academic performance, including FYP scores, and engagement and completion rates. Furthermore, this research contributes to 'resilience theory' by exploring students' adaptability to contextual changes and their enhancement of academic resilience. However, there are some limitations of this study, including the assessment of supervisor workload and expectations, the generalizability and transferability of research outcomes, and the long-term impact on employment prospects. Future research should address these limitations and explore additional personalized factors influencing the FYP allocation process. Based on these findings, several recommendations are proposed to optimize the mechanism, such as fostering a student-centered classroom environment, and finding the balance between strictness and flexibility. This study contributes to understanding effective FYP allocation mechanisms and provides practical insights for educators and institutions.

Data availability

The corresponding authors are willing to share the datasets upon any reasonable request under necessary confidentiality agreements except for the confidential data.

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Author contributions

Conceptualization, HY, WY, and PS; Funding acquisition, ML, NL, EGL, and PS; Investigation, HY, SD, and KJ; Methodology, HY, WY, SD, and RY; Project administration, HY, RY, and ML; Supervision, ML, NL, EGL, and PS; Visualization, HY, WY, and SD; Writing—original draft, HY, RY, and PS; Writing—review & editing, HY, RY, YW, NL, XZ, and PS. All authors have read and agreed to the published version of the manuscript.

Competing interests

The authors declare no competing interests.

Ethical approval

Ethical approval was obtained from the Department Ethics Committee (DEC) at Xi'an Jiaotong-Liverpool University (20-03-21). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Before the study began, the participants were given a consent form, having read through and comprehended the study's purpose and objectives. All those who understood the purpose and goals of the research participated. The consent form included contact information for the authors for inquiries about the study and withdrawal from participation. We believe that the study obtained written consent from all participants by signing the consent form and that the institution's ethics committee granted permission to conduct the research.

Additional information

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