

Ministry of Education

TERTIARY EDUCATION RESEARCH FUND
(TRF)

Grant Resource Guide

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QUALITIES

OF A STRONG TRF PROPOSAL

Objectives	<ul style="list-style-type: none"> • For proposals addressing the themes of the TRF, there are sufficient details to demonstrate the link between the proposed research and the theme(s). • The aims of the research study focus on educational outcomes, as opposed to seeking funding for infrastructure development without clear links to educational outcomes. • Proposal is designed with clear hypothesis/es and/or research aims. • The research question(s), outcomes or aims are clear and specific. • Research design and outcomes are supported with preliminary data that demonstrates the (a) importance of the research question, and/or (b) the rigour of the research design, and/or (c) the contribution of the data in addressing the research aim(s). • Relevance to the objectives of the TRF is demonstrated.
Literature Review	<ul style="list-style-type: none"> • Literature review includes recent, relevant, data-based research that supports the proposed research design and aims. Strong literature reviews validate the proposed research, demonstrating how it would contribute to and be differentiated from existing research. • The gaps in knowledge to be addressed by the proposed research are identified and clearly explained.
Research Design and Methodology	<ul style="list-style-type: none"> • For proposals seeking Tier B funding, findings from preliminary studies to demonstrate the feasibility of the proposed research are included. • The methodology and how the proposed methodology can achieve the aims of the research are clearly explained. • Details and justifications for the sampling strategy (e.g., characteristics, inclusion criteria, selection, power analysis, data adequacy) are clearly provided. • The data analysis procedures are described clearly.
Research Team	<ul style="list-style-type: none"> • The research team's expertise is connected to the proposed research, the research methods, and the analytic procedures to ensure that the team has the capacity to accomplish the research aims.
Timeline & Budget	<ul style="list-style-type: none"> • The proposed work can be completed within the allowed time. • The requested budget is matched carefully to the research plan and demonstrates prudence.

Note: Based on observations by the Expert Panel over the past grant calls.

STEPS TO DRAFTING

A TRF PROPOSAL

a. Review the Administrative Guidelines

Read the TRF administrative guidelines to understand the application process. Ensure that you are eligible to apply for the grant.

b. Time Check

Distilling the essence of your proposal into concise content takes time. Check the submission deadline. Ensure you have sufficient time to write, rewrite, and write again. Factor in time to solicit and incorporate feedback.

c. Information on Past Grant Recipients

Find out more about the types of projects that have been previously funded. Reach out to past TRF recipients, e.g. through your IHL's Office of Teaching and Learning (OTL) to hear from their experiences and for tips on crafting successful proposal. A list of the TRF Grant Recipients can be found in Annex A.

d. Co-develop an Idea with your Team

Identify the problem statement, research objectives and strategies and assemble the right team players. Ensure that the team has the expertise and capacity to accomplish the research aims.

e. Structure your Proposal and Write Clearly

Grant writing is no ordinary task. Ensure that the proposal is concise and self-contained within the specific page limits. Avoid unnecessary details and focus on presenting your research proposal clearly and effectively. Adhering to formatting guidelines will demonstrate professionalism and make your proposal easier to read.

f. Create a Realistic Timeline and Budget

Ensure that the proposed research can be realistically completed within the allocated time frame. The budget should align with your research plan and reflect the necessary resources and expenses.

g. Get Feedback

Feedback is gold! It is always a great idea to get your mentors and colleagues to read your draft proposal. You can also consult the IHL's Office of Teaching and Learning (OTL) for advice.

KEY QUESTIONS

TO ASK

To help create a better and more competitive proposal, you may wish to consider the following questions, adapted from the Heilmeier Catechism.

- What are you trying to do?**
What specific educational challenges and/or gaps are you aiming to address through the TRF project? How can your project address these challenges and/or gaps and improve educational outcomes? Articulate your objectives clearly using absolutely no jargon.
- What has already been done?**
What are the existing practices and why are these not sufficient? How do previous studies or initiatives inform the approach of the proposed project? Is your proposed hypothesis based on updated literature reviews?
- Why do you think your project has a competitive edge and will be successful?**
Why do you think your project can successfully pull-off? What are the unique propositions of your project? Is there evidence to support the potential success of these new approaches? Does your team have the right people to carry out this work? Have you explored inter-institutional collaboration to expand the scope and effectiveness of your project?
- What difference will it make if your project is successful?**
Clearly articulate the positive impact (short-term and/or long-term) you anticipate on students' learning outcomes and overall educational experience? How will the quality of teaching & learning be improved, as a result of the project?
- What specific metrics or indicators will be used to assess the progress and impact of the TRF project on student outcomes?**
How will you assess the impact of the project on student outcomes and overall quality of teaching and learning? What are the key performance indicators (KPIs) used to measure the success of the TRF project?
- What are the risks and potential challenges?**
What are the risks and potential challenges that could impede the success of the project? Have you thought of alternatives to circumvent these limitations?
- How much will it cost? How long will it take?**
What is the anticipated cost involved in carrying out the proposed research? How long will it take to see measurable improvements in teaching and learning practices, as a result of the project? Is the project over-ambitious or under-ambitious?

AGGREGATED

FEEDBACK ON PAST TRF APPLICATIONS

To inform the institutions in their effort to improve the quality of TRF applications, the following feedback was provided based on observations from past grant calls:

S/N	Feedback
1	<u>Quality and academic rigour.</u> Many applications were overly ambitious, proposing projects which seemed unlikely to be possible within the proposed project duration. Many applications did not clearly articulate the methodology and learning outcomes of the proposed research.
2	<u>Literature review.</u> <ul style="list-style-type: none"> Some applications did not cite obvious related literature on the topic. Institutions should remind PIs that applications should be supported with comprehensive literature reviews to demonstrate the feasibility and academic contribution of the project. PIs should avoid superficially alluding to past landmark studies, and instead support their applications with comprehensive and up-to-date literature reviews that inform the proposed work.
3	<u>Themes.</u> Many applicants force-fit their applications into the themes. Institutions should remind PIs that the themes of the TRF call are optional.
4	<u>Budget.</u> Many applicants requested for budget for software such as SPSS or Nvivo which should already have been made available by the institutions.
5	<u>Research Methodology.</u> Many applications were vague vis-à-vis the research methodologies, and concepts that were crucial to underpin the proposed work could have been better defined and explained. PIs should therefore be reminded that their proposals should include a clear articulation of the research methodologies as well as the desired learning outcomes of their studies.
6	<u>Inter-institutional Collaborations.</u> Multi-institution applications were rare, and this limited the impact from projects. Applicants are encouraged to draw on the best research capabilities across Singapore and collaborate across institutions. However, such collaborations must be designed in a meaningful and intentional manner.

Annex A: List of Awarded TRF Projects (2015-2023)

Project Title	Principal Investigator	Host Institution
2023		
Internship Participation and Student Outcomes in Singapore	Prof Jessica Pan	NUS
Virtual Escape Room Simulation-based Education (VERSE) for intra-professional education to improve nursing teamwork and collaboration	A/Prof Liaw Sok Ying	NUS
Shaping Future Thinkers: An Evaluation of Design Thinking's Influence on Student Creative Mindsets for Complex Problem-Solving	A/Prof Yen Ching Chiuan	NUS
PresentationPro: Improving Public Speaking Skills through AI-Driven Virtual Reality Interactions	A/Prof Kyong Jin Shim	SMU
PromptTutor - Generative AI-enabled Personalised Tutor for Reflection Learning in Programming Courses	Asst Prof Ouh Eng Lieh	SMU
Cultivating Entrepreneurial Readiness with a Conversational AI Bot in an Interdisciplinary Design Innovation University-wide Module	Asst Prof Nadya Shaznay Patel	SIT
Understanding and Nudging Polytechnic students' Education and Career decision-making and their Work-related Learning Mindsets for School-to-Work Transition toward Sustainable Employability and Lifelong Learning	A/Prof Ho Moon ho Ringo	NTU
Personalised Online Learning Experience Through Digital Nudging	A/Prof Lee Chei Sian	NTU
Examining instructors' use of feedback dashboards for enhancing teaching and learning	Dr Lin Feng	SUSS
Empowering Novice Programmers with an Interactive AI Chatbot and Gamified Hinting System	Dr Oka Kurniawan	SUTD
2022		
Investigating Active Learning Approaches in Blended Learning Environments to Enhance Learners' Self-regulation	Dr Jayden Ang Wei Jie	NYP
Moving an Undergraduate Population from Data Literacy toward Data Storytelling	Dr Ng Kah Loon	NUS
Developing Global Mindset in Polytechnic students	Mr Cedric Metrat-Depardon	TP
School- to-Work Transfer of Learning Model with Authentic Modelling and Simulation Applications in Undergraduate Engineering Education	A/Prof Alfred Tan Cheng Hock	SIT

Project Title	Principal Investigator	Host Institution
Creating a fully AI-based Adaptive Learning Platform for the Mathematics	Asst Prof Cheong Kang Hao	NTU
2021		
Slide++: Automatic Augmentation of Academic Slides Towards AI-Enabled Student-Centred Learning	A/Prof Hady Wirawan Lauw	SMU
AP-Coach: AI-based formative feedback generation to improve student learning outcomes in introductory programming courses.	Asst Prof Ta Nguyen Binh Duong	SMU
From Suffering to Flourishing: Toward a Synthesis of Mindfulness Practice and Positive Psychology in Tertiary Education	Prof Jochen Reb	SMU
Helping students learn coding with automated feedback and analytics	Dr Kenneth Lim Yang Teck	NTU
Enhanced Learning of Electrical Engineering Core Courses Using Tutorbots with Animated Step-by-Step Guide on Mobile Devices	A/Prof Tan Eng Leong	NTU
New Implementations for a Creative Problem-Solving Framework with Visual-Based Mapping Tool	Dr Teo Chee Chong	NTU
Virtual Reality as a Pedagogical Tool in Chemical Engineering Education	Dr Jangam Sachin Vinayak	NUS
Facilitating students' engagement with feedback	Asst Prof Foo Yang Yann	NUS
Long-term impact of short-term overseas study trips: Implications for higher education experiential learning (HEEL)	Dr Kankana Mukhopadhyay	NUS
2020		
Artificial Intelligent-enabled virtual reality simulation for interprofessional education	A/Prof Liaw Sok Ying	NUS
Development and effectiveness of Artificial Intelligence -Teaching Assistance System (AI-TAS) in enhancing nursing students' engagement, intrinsic motivation, and knowledge application	A/Prof Wang Wenru	NUS
Undergraduates' Writing Development in Higher Education: Short- and Long-Term Indicators of Growth	A/Prof Wu Siew Mei	NUS
Enhancing Clinical Procedures through Deliberate Practice using Immersive Virtual Reality	A/Prof Lau Siew Tiang	NUS
An evaluation of SMU's experiential learning programme ("SMU-X") and its multifaceted impacts on students and graduates	A/Prof Yang Hwajin	SMU

Project Title	Principal Investigator	Host Institution
Not for Girls? Gender Imbalance in STEM and Its impact on Female Students' Creative Performance	A/Prof Cheng Chi-Ying	SMU
The Efficacy of a Bespoke Adaptive-enabled System in Higher Education	Dr Lyndon Lim	SUSS
How Time-Oriented Projections Foster Creativity and Social Innovation	Dr Koh Yuan Rui Brandon	SUSS
Supporting academically weaker students by improving their self-regulation for online learning	A/Prof Eric Chua	SIT
Investigating the Design and Implementation of Electronic Service-Learning to Facilitate Academic Learning, Civic Learning and Personal Growth of Polytechnic Students	Ms Jessie Tan	NP
2019		
Intelligent Adaptive Learning Platform for Structural Systems	A/Prof Goh Yang Miang	NUS
Using peer feedback to enhance nursing students' clinical competency, reflective ability and sense of empowerment	A/Prof Wang Wenru	NUS
An Efficacy Study of the English Proficiency Programme	Dr Bo Wenjin	SUSS
Preparing Accountants of the Future: Evaluating a Programme in Accounting Data & Analytics	A/Prof Seow Poh Sun	SMU
Investigating the Effectiveness of Different Methods of Peer Review in Tertiary-Level Writing Courses in Singapore	Dr Hsieh Yi-Chin	NTU
Reimagine Medicine and Engineering: Stimulating Collaborative Creativity Using Team-Based Approach	Asst Prof Sreenivasulu Reddy Mogali	NTU
Assessing the Learning Outcomes of Makerspaces in Terms of Creativity and Innovation of Undergraduates	A/Prof Andy Khong	NTU
Machine learning-mediated immediacy for synchronous communication in online classrooms	Asst Prof Cheow Wean Sin	SIT
Industry Ready Graduates: Scaffolding industrial relevance in pharmaceutical engineering program	A/Prof Wong Shin Yee	SIT
Fully Integrated Gamified Virtual Reality Environment for STEM Education	Asst Prof Cheong Kang Hao	SUTD

Project Title	Principal Investigator	Host Institution
2018		
The Study of the Impact of ITE-designed Automated Exercise System on Student Sport Performance at Institute of Technical Education (ITE)	Mr Low Wai Yee	ITE
Collaborative Virtual Reality Simulation Learning Package for Aerospace Technology Training in Institute of Technical Education	Mr Ho Wye Kei Benny	ITE
Investigating the Effectiveness of Transdisciplinary Project-based Learning Approach as a Method to Teach RIE-related Modules Across Multiple Disciplines	Dr Cherine Tan Meng Fong	NYP
Exploring Virtual Reality to Improve Chemical Engineering Learning Outcomes	A/P Jeannie Lee Su Ann	SIT
Gamified Micro-learning Platform: an Early Intervention for at-risk Freshmen	A/P Lim Sok Mui May	SIT
Fusing Communication Skills and Engineering Knowledge: A Co-teaching Program	Asst. Prof Chan Wai Lee	NTU
Leveraging Immersive Technologies for Flipped Learning: Impact on Engineering Students' Situational Interest and Self-Efficacy	A/P Cai Yiyu	NTU
3D Printed Models for Anatomy Teaching and Learning	Asst. Prof Sreenivasulu Reddy Mogali	NTU
Effects of Simulation-based Learning on Authentic Learning of Risk Management	A/P Goh Yang Miang	NUS
Elucidating Three-dimensional Visualization Technologies (3DVTs) in Developing Student's Spatial Anatomical Understanding	A/P Yen Ching Chiuan	NUS
2017		
Developing an internship framework for professional identity development: A study of sports coaches and outdoor educators in Singapore	Dr Yeong Poh Kiaw	RP
Integrated Laboratory and Tutorial: Spatial and Temporal Convergence of Tutorial Concepts in Laboratory Activities and the Effect on Chemistry Competencies and Lesson Experiences	Ms Lau Poh Nguk	TP
Deepening literacy skills through guided experiential augmented reality learning interactions	Mr Christopher Pang	NYP

Project Title	Principal Investigator	Host Institution
Investigating relationships among designs and delivery strategies, perceived learning, and student engagement in online lessons: A structured equation modelling approach	Ms Grace Pheang	NYP
Exploration of virtual games to enhance nursing students' hand hygiene compliance in the clinical environment	Ms Jessica Lim	ITE
Development, validation, and application of a work-readiness assessment inventory (WRAI)	Dr Betsy Ng	NTU
Use of virtual patients to enhance communication skills of nursing undergraduates: A Mixed Method Study	A/P Shefaly Shorey	NUS
Web-based Clinical Pedagogy Program to enhance nurse preceptors' teaching competency and nursing students' learning outcomes in clinical competency	Dr Vivien Wu	NUS
Efficacy of the MIND-NURSE programme on social-emotional learning, psychological and academic outcomes among nursing students: a pilot randomised control trial	A/P Piyanee Yobas	NUS
Effects of visualisation method for education of building systems in architecture education	Dr Lau Siu-Kit	NUS
The Effects of Feedback on Project-Based Learning	A/P Sarah Cheah	NUS
Evaluating Engagements and Outcomes in case-based collaborative learning through dialogic interaction analysis	Dr Yang Lu	NUS
Interprofessional collaborative learning: Is it effective in transforming health and social care undergraduates into collaborative practice-ready health workers?	A/P Chui Wai Keung	NUS
Bite-sized Learning for Adult Learners: an Efficacy Study	Dr Ho Yan Yin	SUSS
Explorable explanations: An interactive learning framework to enhance student learning	Asst. Prof Ate Poorthius	SUTD
2016		
Impact of Service-Learning with Structured Reflections on Civil Responsibility, Academic Connections and Personal Growth in Polytechnic Students	Dr Choo Lay Hiok Juliet	NP
Enhancing Students' Intrinsic Motivation: An Evidence-Based Approach	Mr Dennis Sale	SP

Project Title	Principal Investigator	Host Institution
A model manufacturing plant for pharmaceutical process engineering education	Dr Wong Shin Yee	SIT
The Effect of In-class Education Group Game (EGG) on Students' Learning Motivation and Academic Achievement	Ms Ng Yin Ni Annie	NYP
To Investigate the Effectiveness of Mediated Learning Experience (MLE) in the Learning of Technical Modules	Mr Wong Poh Seng	NYP
Learning Analytics on Qualitative Student Feedback to Improve Teaching and Learning in Higher Education	Dr Swapna Gottipati	SMU
When Academic Cultures Clash – An Exploration of Creativity Benefits of Doing Double Major	A/Prof Ivy Lau	SMU
Productive Failure via Educational Games for Tertiary Education	Dr Anupam Chattopadhyay	NTU
Learning Effectiveness of the Knowledge Co-Creation Approach to Ill-Structured Problems	Dr Pee Loo Geok	NTU
Social-psychological Interventions for Empathy and Leadership Ability Development in Business Students	Dr Kumaran Rajaram	NTU
Promoting Student Performance & Motivation with A Growth Mindset of Interest	Dr Paul A O'Keefe	NUS
Solving Ill-Structured Problems: Role of scaffolding and feedback	A/Prof Yeong Foong May	NUS
The Effects of Explicit Instruction on Graduate Teaching Assistants' (GTAs) use of collaborative learning scripts and academic mindsets	Dr Mark Gan Joo Seng	NUS
Visual Attentional Focus in Expert Reasoning to Improve Accuracy in Diagnostic Imaging	A/Prof Kelvin Foong	NUS
VIP: Virtual Integrated Patient for Exploratory Learning	Prof Edmund Lee	NUS
2015		
Targeting Misconceptions: Socratic Questioning in Chemical Engineering	Ms Chian Hwey Min	NYP
Gamification of E-learning to Enhance Student Engagement in E-learning Modules	Dr Edirisinghe, EM Nalaka S	TP
Student Self-assessment: An Empirically Grounded Framework and its Impact on Self-regulation	Ms Tan Lay Khee	TP
Crowdsourcing a Personalized Practice Environment for Mathematics through Data Analytics	Dr Cheung Hui Siu	NTU

Project Title	Principal Investigator	Host Institution
Interactive Mobile Toolkit Apps Supplementable with 3D Display to Enhance Teaching and Learning of Tertiary Electromagnetics	A/Prof Tan Eng Leong	NTU
Syntactic Well-Formedness Diagnosis and Error-Based Coaching in Computer Assisted Language Learning using Machine Translation Technology	Dr Francis Charles Bond	NTU
Virtual Rooms for Teaching Sciences	A/P Rainer Dumke	NTU
Evidence-Based Teaching of Literature Review Writing	Dr Christopher Khoo Soo Guan	NTU
Student Learning and Teaching Effectiveness of Project-Based Learning in Modules on Health Systems and Global Health	Dr Alan Wong Wai Pong	SIT
Experiential learning in occupational therapy education: Engaging persons with disabilities to develop competencies in students	Dr Lim Sok Mui, May	SIT
Evaluating SMU-X Pedagogy: an Innovative Approach to Prepare University Students with Future Work Skills	Dr Gary Pan	SMU

ANNEX B: FREQUENTLY ASKED ADMINISTRATIVE QUESTIONS

1. GENERAL		
1.1	What does the funding cover?	The research grant can be used to cover EOM, equipment, consumable costs as well as travel expenses. It does not cover the salaries of PIs and Co-Is.
2. ELIGIBILITY		
2.1	What are the eligibility criteria? Are they applicable to both the Principal Investigators (PIs) and Co-Investigators (Co-Is)?	<p>Applicants for the TRF Grant Call are required to be full-time staff (i.e. minimum commitment of 9 months per year) of the IHLs at the time of application, as well as during the entire project duration.</p> <p>This criterion is applicable to all applicants applying as PIs as well as Co-Is.</p>
2.2	Are there any nationality restrictions for application of TRF Grant Call?	Applicants of any nationalities are welcome to apply for the TRF Grant Call.
3. THE PROCESS		
3.1	Can you tell me more about the selection process?	All eligible TRF applications will be reviewed by the Expert Panel comprised of prominent academics. Reviews may be supplemented by independent reviewers who possess relevant subject-matter expertise.
3.2	What are the evaluation criteria of the TRF Grant?	All TRF proposals will be evaluated based on the following considerations: technical merits, effective collaborations, quality of research team and feasibility of budget and resource plan.
3.3	How can I make my proposal more competitive for the grant?	<p>Your research proposal must convince the reviewers that your research is worthwhile and that your team have the competence, plan and resources necessary to achieve the goals.</p> <p>You can refer to the TRF Grant Resource Guide for preparation of your proposal. Where necessary, do seek guidance from your institutions' Teaching and Learning Offices.</p>

3.4	How can I ensure that my objectives are specific, measurable, achievable, relevant and time-bound (SMART)?	You can break down your research objectives into clear and focused components. Always ensure that they are realistic and can be accomplished within the proposed timeline.
3.5	Is collaboration with researchers from other host institutions beneficial for a successful application?	<p>Cross-institutional / departmental collaborations will not only strengthen your application but also demonstrates to the reviewers a unified commitment to address complex issues. The first step to a successful cross-institutional / departmental collaboration is to identify the right collaborators. Look for people with the right expertise that share your goals and could bring different strength to your proposed work. Always remember to emphasis in your proposal, the collective expertise that will contribute to the success of your project.</p> <p>For a start, you can refer to the list of PIs of awarded TRF project (Annex A) to identify researchers to collaborate with.</p>
4. THE AWARD		
4.1	I am recommended for the award. When can I start my project?	The start date of the TRF project is the date on which the project account is activated. This should take place within six months from the date where the Letter of Conveyance is sent to the IHLs. Failure to activate the account within the timeframe will result in the lapse of project approval.
4.2	Can my international collaborators receive fundings for some elements of the work done?	TRF fundings should not be channeled to collaborators. However, TRF awardees may propose OOE budget lines for Visiting Professors/Experts, which can cover the honorarium, accommodation, and travel expenses. Visiting positions should be clearly identified in the budget, with justifications for the visits provided.

4.3	Can the TRF grant be transferred to another PI/Co-I?	The TRF Grant can be transferred to another PI/Co-I, subject to the Grantor's approval. MOE reserves the right to terminate the grant if the proposed PI/Co-I is found to be not suitable for the replacement.
4.4	Can the TRF PI request for a change of host institution?	Grantor's approval would be required for a change of host institution.

ANNEX C: FINAL CHECKLIST

Eligibility

- Do you and your Co-Is meet the eligibility criteria outlined in the grant call document?
- Have you ensured that the same proposal has not been concurrently submitted to another grant?

Proposal

- Have you followed the required formatting guidelines specified in the grant call documents?
- Have you structured your proposal to include all the required sections as specified in the grant call document?
- Is your project title clear, concise and free to jargon?
- Is your proposal well-organised and easy to understand?
- Have you provided sufficient literature reviews to support the feasibility and potential impact of your research?
- Has your proposal addressed all evaluation considerations specified in the grant call documents?

Application

- Have you taken note of the application submission deadline?
- Have you completed all sections in the TRF application form?
- Have you attached the CVs of all the research team members to the end of the application form?
- Have you attached the detailed proposal to the end of the application form?
- Have you included all required approvals, permits, letter of support etc.?