Expanding the concept of 'threshold concepts': threshold concepts for life

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Abstract

News and media reports indicate that the perceived value of university education is declining amongst students – one of the indicators being an increase in apprenticeships. As educators, we need to identify the reasons for this and ask ourselves whether we provide holistic education to students. Based on this rationale, this forward-looking and solution-focussed opinion article invites the educators to think beyond the subject-specific threshold concepts and teach students the 'threshold concepts for life'. This proposed term implies, includes, and collates teaching-learning of multiple concepts that are often outside the discipline/subject-specific boundaries of several curricula, but can help develop life-skills and thought-processes that promote mental, physical, and societal well-being. To enable such teachings, six domains of education can be embedded within the curricula of ALL disciplines. These domains include education on sustainability, equality, diversity and inclusion, arts, resilience, moral science/personal integrity, and physical activity. To support the inclusion of these domains, this article discusses the significance of each domain and provides evidence of the positive impact of its application on students. Logistics of embedding these within the curricula of ALL students have been suggested and the core benefits of including these domains in university education are mentioned.

Keywords: threshold concepts; resilience; moral education; equality; inclusion; sustainability; art.

Context and the rationale for this piece

News published in the *Independent* in May 2010 revealed that one sixth of 16,000 students surveyed regret going to the university (Garner, 2010). In 2017, *The Telegraph* published that one out of five students regretted their choice of university (Yorke, 2017). Similarly, in July 2018, data published using Barclays' apprenticeships indicated that half of students/graduates regretted going to university (Muller-Heyndyk, 2018) and about 50% of university students were not prepared for employment, according to *Prospects* (2021). In 2024, *Forbes* newsletter revealed that students' confidence in the value of degrees has decreased and the value of job training has increased (Reilly, 2024). This attitude is not confined only to the US but is also prevalent in the UK where apprenticeships increase every year (Gov.UK, 2024).

This indicates that the students' faith in university education is dwindling and it's not as high as we expect. Why is that? What does university education not provide? Are universities providing valuable education? Does it teach moral values, personal integrity and help character building? Or life skills that prepare students to lead a mentally and physically healthy life while making a positive contribution to the society?

If we wish to make higher education valuable and desirable, then we need to broaden our thoughts, make alterations and additions to the curricula, and prepare students for life. This forward-looking and solution-focussed article invites educators to think beyond subject-specific threshold concepts and provide all-rounded education to ALL students that they can be proud of and find useful even 30-40 years after graduation.

Broadening the concept of 'threshold concepts' to 'threshold concepts for life'

First described in 2003 by Meyer and Land (2003), threshold concepts refer to the concepts that are essential and core for understanding a particular subject and that transform the way students understand that subject while building a foundation for further understanding. To understand the core concept of a subject/topic, the student needs to enter a transition/intermediate/liminal state of thinking (Olaniyi, 2020). Thus, a threshold

concept is characterised as being transformative, likely irreversible, integrative, bounded, reconstitutive, sometimes counter-intuitive, and discursive (Jones and Hammond, 2022).

Usually, threshold concepts are applied or discussed in a subject-specific context. For example, there are threshold concepts in Health professions education (Liljedahl, Palmgren and McGrath, 2022), Medical education (Hall and Chae, 2022; Jones and Hammond, 2022), Biochemistry (Loertscher et al., 2014), Radiation Physics (Hudson, Engel-Hills and Winberg, 2018), Physiology (Horrigan, 2018), Neuroscience (Sandrone and Alavian, 2021), and Geographical Systems (Srivastava, 2013).

To restore, maintain and increase students' faith in university education, educators should think beyond subject-education, cater to the holistic nature of 'Education', lift the subject-specific boundaries of threshold concepts and expand these to the idea of 'threshold concepts for life'. The latter term is coined for the first time in this article (to the author's knowledge). It implies, includes and collates teaching-learning of a range of concepts outside the prescribed discipline/subject-specific curriculum to develop demonstratable life-skills and thought-processes in ALL students and thereby promote mental, physical, and societal well-being.

The questions that arise are: Teaching of which concepts/domains can help students learn the threshold concepts for life? What do these threshold concepts encompass? Table 1 proposes six domains of education that can be incorporated within the curricula of ALL disciplines to help ALL students learn these threshold concepts for life. These include education on sustainability, equality, diversity and inclusion, arts, resilience, moral science/personal integrity, and physical activity. This article refers to the learnings offered by these domains as threshold concepts for life, and the foundation for providing and gaining holistic education.

Table 1. Six domains of education for learning threshold concepts for life.

Domains of education	Important for:	Mostly or only studied as a core part of curriculum by students on:
1. Sustainability	Societal health	Natural Sciences, Environmental Sciences, Marketing, Business or Management courses.
2. Equality, diversity, and inclusion (EDI)	Societal health	Humanities, Social Sciences courses, and to some extent on Medicine/Healthcare-related degrees.
3. Arts	Students' mental wellbeing, Societal health	Performing Arts-related (e.g., music, dance), and Fine Arts-related courses.
4. Resilience	Students' mental wellbeing	None of the university courses.*
5. Moral science/ Personal integrity	Students' mental wellbeing, Societal health	None of the university courses.*
6. Physical education/activity	Students' physical and mental wellbeing	None of the university courses.*

*To the author's knowledge

The following sections discuss the proposed six domains and provide literature-based evidence of the significance of these domains in the context of students.

Domain-1: Education on sustainability

Sustainability involves practices that maintain environmental, social, and economic health. It is on the national agenda of several countries, and for the successful implementation of its practices, it is important that the youth is engaged with it. However, the concept of sustainability is usually studied within the curricula of only certain disciplines (Table 1). For example, research conducted by a Spanish university revealed that there is very low presence of sustainability within the curricula of Science of Education degree courses, but both teachers and students show interest in sustainability teaching-learning (Solís-Espallargas et.al., 2019). Sustainability concepts should not be restricted to a small set of students of a certain discipline, but these should be taught to students of all disciplines so that students can take responsibilities towards the environment and the society.

Sustainability learnings do make a positive difference, for example, data collected on perceptions/opinions on sustainability from students on a Management Engineering programme at an Italian university revealed that by the end of the term, these students held more and improved sustainable attitudes. These students demonstrated their potential to problem solve and therefore could help accelerate the green transition. Moreover, students' engagement in such real-world projects can benefit them, and give them more confidence for tackling complex real-life issues (Biancardi, Colasante and D'Adamo, 2023).

Domain-2: Education on equality, diversity, and inclusion (EDI)

There are several issues that fall under EDI, for example, gender pay-gap and racism. The European Commission states that in the European Union, in 2021, the gender pay-gap existed and women earned 13% less per hour than men (European Commission, 2022) . In the UK, the HMRC data reveals that the mean gender pay-gap is 10% (Gov.UK, 2022). Concurrently, in 2021 *The Guardian* reported that UK schools recorded >60,000 incidents of racism in five years (Batty and Parveen, 2021). In higher education, black students face overt and covert racism (Osbourne, Barnett and Blackwood, 2023). On yet another occasion, BBC news reported an apology from a UK university over racist slurs in class (McInnis, 2023).

Where and how do such attitudes emerge? It is partly because the educators are not delivering appropriate training to young adults. Conscientious educational institutions offer EDI courses and training to staff to make them aware of the legal and institutional regulations around EDI, and such interventions do have positive outcomes (Hill Weller et al., 2024). In providing training, the underlying thought is to create a positive working environment where the staff respect, and are sensitive to, others' attitudes and thoughts. While this training exists for staff members, it is important that the students also receive such training, and that these values are inculcated in the early phases of life. Indeed, studying cultural competency (which upholds the values of EDI) has been a trend in recent times, but its concepts are taught as compulsory modules only to a limited/specific group of students that study a particular discipline, while for other students, these are either offered as optional modules or not offered at all. Regular EDI training should be made mandatory for all students.

Domain-3: Arts education

Performing arts, fine arts or making arts; any form of art can help with students' engagement, enhance their creative thinking, and improve mental and physical wellbeing (Fancourt and Finn, 2019). Engagement with arts in those aged 18 to 28 has been shown to increase flourishing, a positive state of mind that involves feeling good and functioning well (Bone et al., 2022). For example, a study conducted during the Covid-19 pandemic, revealed associations of music activities (for example, listening to music or playing a musical instrument) with low anxiety levels and high resilience levels (Chen et al., 2022). Listening to music has been found to reduces stress and reduce blood glucose levels (Finn and Fancourt, 2018). Creative Arts therapy involving art, music, dance/movement, and drama therapy has been shown to reduce stress (Martin et al., 2018).

Domain-4: Resilience training

It is generally known that the mental health of university students is not optimal. There is a high prevalence of stress, anxiety, and depression in university students (Wang et al., 2020; Basheti et al., 2023), and suicides in college/university students have been reported (Office for Students, 2022; Zhai and Du, 2022).

Resilience involves acceptance of an adverse situation and then successfully adapting to it. The idea of building resilience through mindfulness, cognitive behaviour therapy, psychoeducation and other activities has gained attention in recent times (Brewer et al., 2019)**,** and resilience interventions can make a positive impact on individual resilience (Joyce et al., 2018). For example, in a group of healthcare professionals, interventions with workshops and one-to-one coaching sessions were well-received and effective (Johnson et al., 2020). Anger outbursts and irritability in young people can be regulated by building resilience (Singh, Hu, and Miklowitz, 2021). University students that participated in coaching enjoyed the process and showed increased confidence and motivation, along with improved self-efficacy towards initiating a behaviour change and attaining goals (Bleck et al., 2022).

Domain-5: Personal integrity

The development of personal values and a good character is essential. Moral education helps to live with dignity and integrity, and it is related to human happiness (Yan and Ke, 2022). Not only is this important to make good citizens, but it is also important for academic learning because personal values influence learning approaches and academic achievement (Gamage, Dehideniya and Ekanayake, 2021).

In current times, educators are battling plagiarism due to Open AI platforms, as reported by *Forbes* (Westfall, 2023), and a rise in plagiarism on university applications is reported by *The Times* (Kendix, 2024)*.* The main driver of plagiarism in higher education is thought to be easy access to information technology and the Web (Jereb et al., 2018). Thus, there have been instances when students have admitted to cheating in online exams (Malik et al., 2023). There is no denial that academic dishonest is highly prevalent (Baran and Jonason, 2020). On the other hand, Mastroianni and Gilbert defy the generic notion of decline in morals and suggest that the perception of moral decline in current times is an illusion (Mastroianni and Gilbert, 2023). This is great news. However, for this idea to remain an illusion and ensure that it does not turn into a reality, it is important for the educators to make efforts and ensure that moral science is learned by all university students. Educators need to include moral values in the set of graduate attributes. This is because students' values will determine how they perceive themselves and interact with others. There is evidence that moral education interventions work. For example, a study

with students in Turkey revealed that a mandatory ethics and moral education course had the effect of decreasing schadenfreude (pleasure derived from somebody else's misfortune) (Cerit, 2024). Similarly, in college students, participation in volunteer services was found to positively relate to students' performance of moral education and their mental health (Lv, Ying and Chen, 2024).

Domain-6: Physical education/activity

Selection of an unhealthy lifestyle such as a preference for high fat and sugar foods means obesity is highly prevalent amongst university students throughout the world (Tapera et al., 2017; Wan Mohamed Radzi et al., 2019; Telleria-Aramburu and Arroyo-Izaga, 2022). It is believed that the prevalence of obesity in this group is between 20% to 40%, which poses a significant public health problem (Ilić, et al., 2024). World health organisation guidelines recommend about 150 to 300 minutes of moderate physical activity or 75 to 150 minutes of vigorous physical activity per week for university students, but a significant proportion of the student group does not meet these recommendations (Johannes et al., 2024). In the UK, only 36% of universities have physical activity programmes, with only a few UK universities offering related interventions to students (Malagodi et al., 2024). Indeed, several universities do offer dance and sports clubs that involve physical activity, but this is not accessed by all students. Alongside, data clearly indicates that physical activity interventions can improve students' quality of life, improve mental health, and promote weight loss in some cases (Plotnikoff et al., 2015; Donnelly, Penny and Kynn, 2024). Such interventions in university students have been found to be effective: i.e., these have found to increase the total and moderate-to-vigorous physical activity after the intervention compared to control groups (Yuan et al., 2024). Moreover, researchers have identified interventions (domains of environmental context and resources, social influences and goals) that can make a difference and increase/enhance physical activity amongst university students (Brown et al., 2024).

### What the educators can do: The logistics

1. Embed ALL these domains within ALL curricula at small or large scale, as appropriate, so that ALL students benefit.

2. Present these domains as core rather than optional.

3. Highlight to students the threshold concepts for life that each domain teaches/offers, and thereby encourage their involvement and engagement in learning these domains.

4. To teach these, schedule short sessions over a long period of time so that the idea is reinforced.

5. Teach these domains to the students for their entire duration of study at the university.

6. No exams or assessments on these domains but make attendance compulsory.

Core benefits of including these domains in university education

Figure 1 presents an overview of how the proposed six domains (that can help learn the threshold concepts for life) influence personal and societal health.

Fig.1 Six domains that will help learn threshold concepts of life.
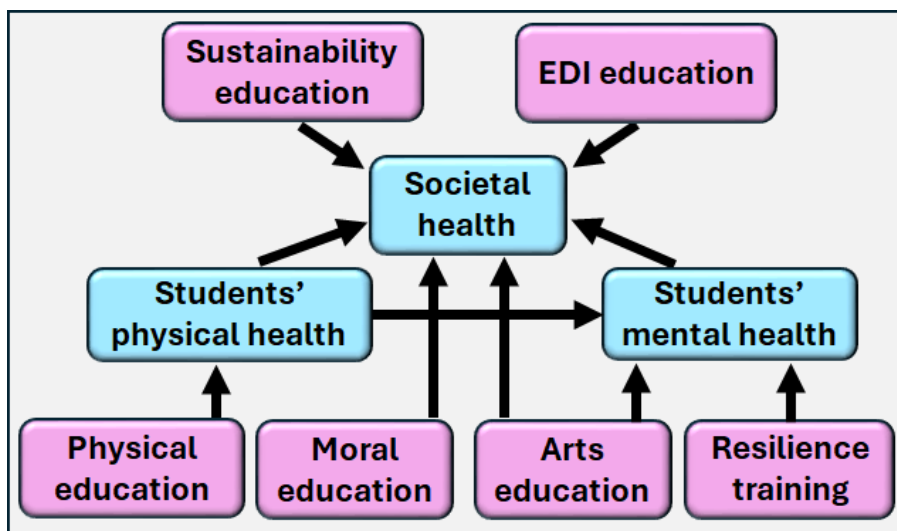
EDI: Equality, diversity and inclusion.

The figure showcases the influence of the six domains of education (sustainability, EDI, physical, moral, arts and resilience education) on students' physical and mental health, and the society.

Inclusion of these domains within curricula can provide several benefits, for example:

a) Facilitate the provision of well-rounded multidisciplinary education.

b) Increase the time students spend on campuses and so: i) help in increasing their attendance on academic courses, ii) increase their sense of belonging to the university, iii) provide more opportunities to connect with fellow students and build real-life relationships outside their social media/virtual accounts, and iv) promote appreciation of the value of university education for several decades after graduation.

c) Provide more job opportunities as this inclusion will require recruitment of experts from various fields, thereby benefitting the society.

Summary

For university education to be valued, these proposed six domains should be included within the curricula of ALL disciplines so that ALL students benefit. These domains will facilitate the learning of sustainability, EDI, arts, resilience, moral science, and physical activity and bring mental, physical and societal benefits. Undoubtedly, this inclusion will pose challenges (for example, in the context of resourcing, quality assurance, mode of delivery, political challenges of implementing non-subject-specific curricula), but it will increase the value of higher education and better prepare students for real life.

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References

Baran, L. and Jonason, P. K. (2020) 'Academic dishonesty among university students: the roles of the psychopathy, motivation, and self-efficacy', *PLoS ONE*, 15(8), e0238141.

Basheti, I. A., Assaraira, T. Y., Obeidat, N. M., Al-haq, F. A. and Refai, M. (2023) 'Assessing anxiety and depression among students post-Covid-19: exploring associating

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factors', *Psychology Research and Behavior Management*, 161797-1810. Available at: https://doi.org/10.2147/PRBM.S409632.

Batty, D. and Parveen, N. (2021) 'UK schools record more than 60,000 racist incidents in five years', *The Guardian*, 28 March. Available at: https://www.theguardian.com/education/2021/mar/28/uk-schools-record-more-than-60000-racist-incidents-five-years (Accessed: 12 June 2024).

Biancardi, A., Colasante A and D'Adamo I. (2023) 'Sustainable education and youth confidence as pillars of future civil society', *Scientific Reports*, 13955. Available at:https://doi.org/10.1038/s41598-023-28143-9.

Bleck, J., DeBate, R., Garcia, J. and Gatto, A. (2023) 'A pilot evaluation of a university health and wellness coaching program for college students', *Health Education & Behavior: The Official Publication of the Society for Public Health Education*. Available at:https://doi.org/10.1177/1090198122113126.

Bone, J. K., Bu, F., Sonke, J. K. and Fancourt, D. (2023) 'Longitudinal associations between arts engagement and flourishing in young adults: a fixed effects analysis of the panel study of income dynamics', *Affective Science*, 4(1), pp.131-142. Available at:https://doi.org/10.1007/s42761-022-00133-6.

Brewer, Margo. L., van Kessel, G., Sanderson, B., Naumann, F., Lane, M., Reubenson, A. and Carter, A. (2019) 'Resilience in higher education students: a scoping review', *Higher Education Research & Development*, 38(6), pp.1105-1120. Available at:https://doi.org/10.1080/07294360.2019.1626810.

Brown, C. E. B., Richardson, K., Halil-Pizzirani, B., Atkins, L., Yucel, M. and Segrave R. A. (2024) 'Key influences on university students' physical activity: a systematic review using the Theoretical Domains Framework and the COM-B model of human behaviour', *BMC Public Health*, 24(1), 418. Available at: https://doi.org/10.1186/s12889-023-17621-4.

Cerit, Y. (2023) 'The effect of ethics and moral education on the levels of schadenfreude experienced by students', *International Journal of Psychology: Journal International De Psychologie*, 59(1), pp.163-171. Available at:https://doi.org/10.1002/ijop.12960.

Chen, Y., Zeng, X., Tao, L., Chen, J. and Wang, Y. (2022) 'The influence of arts engagement on the mental health of isolated college students during the COVID-19 outbreak in China', *Frontiers in Public Health,* 101021642. Available at: https://doi.org/10.3389/fpubh.2022.1021642.

Donnelly, S., Penny, K. and Kynn, M. (2024) 'The effectiveness of physical activity interventions in improving higher education students' mental health: a systematic review', *Health Promotion International*, 39(2), daae027. Available at: https://doi.org/10.1093/heapro/daae027.

European Commission (2022) *The gender pay gap situation in the EU*. Available at: https://commission.europa.eu/strategy-and-policy/policies/justice-and-fundamental-rights/gender-equality/equal-pay/gender-pay-gap-situation-eu_en (Accessed: 12 June 2024).

Fancourt, D. and Finn, S. (2019) '2. RESULTS', in 'What is the evidence on the role of the arts in improving health and well-being? A scoping review', *WHO Regional Office for Europe*. Available at: https://www.ncbi.nlm.nih.gov/books/NBK553778/ (Accessed: 26 May 2024).

Finn, S. and Fancourt, D. (2018) 'The biological impact of listening to music in clinical and nonclinical settings: a systematic review', in Christensen, J. F. and Gomila, A. (eds.) *Progress in brain research: the arts and the brain*. Elsevier, pp.173-200. Available at: https://doi.org/10.1016/bs.pbr.2018.03.007.

Gamage K. A. A, Dehideniya, D. M. S. C. P. K. and Ekanayake S. Y. (2021) 'The role of personal values in learning approaches and student achievements', *Behavioral Sciences*, 11(7), 102. Available at: https://doi.org/10.3390/bs11070102.

Garner, R. (2010) 'Sixth of students regret going to university', *Independent*, Education

News, 27 May. Available at:
https://www.independent.co.uk/news/education/education-news/sixth-of-students-regret-going-to-university-1983917.html (Accessed: 3 September 2024)

Gov.UK (2022) *HMRC gender pay gap report 2022*. Available at:
https://www.gov.uk/government/publications/hmrc-and-valuation-office-agency-gender-pay-gap-report-and-data-2022/hmrc-gender-pay-gap-report-2022 (Accessed: 12 June 2024).

Gov.UK (2024) *Apprenticeships, Academic year 2023/24*. Available at: https://explore-education-statistics.service.gov.uk/find-statistics/apprenticeships (Accessed: 26 May 2024).

Hall, K. and Chae, A. (2022) 'Identifying threshold concepts in postgraduate general practice training: a focus group, qualitative study', *BMJ Open*, 12(6), e060442. Available at: https://doi.org/10.1136/bmjopen-2021-060442.

Hill Weller, L., Rubinsky, A. D., Shade, S. B., Liu, F., Cheng, I., Lopez, G., Robertson, A., Smith, J., Dang, K., Leiva, C., Rubin, S., Martinez, S. M., Bibbins-Domingo, K. and Morris, M. D. (2024) 'Lessons learned from implementing a diversity, equity, and inclusion curriculum for health research professionals at a large academic research institution', *Journal of Clinical and Translational Science*, 8(1), e22. Available at: https://doi.org/10.1017/cts.2024.6.

Horrigan, L. A. (2018) 'Tackling the threshold concepts in physiology: what is the role of the laboratory class?', *Advances in Physiology Education*, 42(3), p.507-515. Available at: https://doi.org/10.1152/advan.00123.2017.

Hudson, L., Engel-Hills, P. and Winberg, C. (2018) 'Threshold concepts in radiation physics underpinning professional practice in radiation therapy', *International Journal of Practice-based Learning in Health and Social Care*, 6(1), pp.53-63. Available at: https://doi.org/10.18552/ijpblhsc.v6i1.421.

Ilić M., Pang H., Vlaški T., Grujičić M. and Novaković, B. (2024) 'Prevalence and

associated factors of overweight and obesity among medical students from the
Western Balkans (South-East Europe Region)', *BMC Public Health*, 24(1), 29.
Available at: https://doi.org/10.1186/s12889-023-17389-7.

Jereb, E., Perc, M., Lämmlein, B., Jerebic, J., Urh, M., Podbregar, I. and Šprajc, P. (2018)
'Factors influencing plagiarism in higher education: a comparison of German and
Slovene students', *PLoS ONE*, 13(8), e0202252. Available at:
https://doi.org/10.1371/journal.pone.0202252.

Johannes C., Roman N. V., Onagbiye S. O., Titus, S. and Leach, L. L. (2024) 'Strategies
and best practices that enhance the physical activity levels of undergraduate
university students: a systematic review', *International Journal of Environmental
Research and Public Health*, 21(2), 173. Available at:
https://doi.org/10.3390/ijerph21020173.

Johnson, J., Simms-Ellis, R., Janes, G., Mills, T., Budworth, L., Atkinson, L. and Harrison
R. (2020) 'Can we prepare healthcare professionals and students for involvement in
stressful healthcare events? A mixed-methods evaluation of a resilience training
intervention', *BMC Health Services Research*, 20(1), 1094. Available at:
https://doi.org/10.1186/s12913-020-05948-2.

Jones, H. and Hammond, L. (2022) 'Threshold concepts in medical education: a scoping
review', *Medical Education*, 56(10), pp.983-993. Available at:
https://doi.org/10.1111/medu.14864.

Joyce, S., Shand, F., Tighe, J., Laurent, S. J., Bryant, R. A. and Harvey, S. B. (2018) 'Road
to resilience: a systematic review and meta-analysis of resilience training
programmes and interventions', *BMJ Open*, 8(6). Available at:
https://doi.org/10.1136/bmjopen-2017-017858.

Kendix, M. (2024) 'Huge rise in plagiarism on university applications', *The Times*, 8
January. Available at: https://www.thetimes.com/uk/education/article/huge-rise-in-
plagiarism-on-university-applications-97tz8lnsp (Accessed: 12 June 2024).

Liljedahl, M., Palmgren, P. J. and McGrath, C. (2022) 'Threshold concepts in health professions education research: a scoping review', *Advances in Health Sciences Education*, 27(5), pp.1457-1475. Available at: https://doi.org/10.1007/s10459-022-10127-5.

Loertscher, J., Green, D., Lewis, J. E., Lin, S. and Minderhout, V. (2017) 'Identification of threshold concepts for Biochemistry', *CBE Life Sciences Education*, 13(3), pp.516-528. Available at: https://doi.org/10.1187/cbe.14-04-0066.

Lv, Z., Ying, C. and Chen J. (2024) 'The impact of volunteer service on moral education performance and mental health of college students', *PloS One*, 19(4), e0294586. Available at: https://doi.org/10.1371/journal.pone.0294586.

Malagodi, F., Dommett E., Findon J. and Gardner, B. (2024) 'Physical activity interventions to improve mental health and wellbeing in university students in the UK: a service mapping study', *Mental Health and Physical Activity*, 26100563. Available at: https://doi.org/10.1016/j.mhpa.2023.100563.

Malik, A. A., Hassan, M., Rizwan, M., Mushtaque, I., Lak, T. A. and Hussain, M. (2023) 'Impact of academic cheating and perceived online learning effectiveness on academic performance during the COVID-19 pandemic among Pakistani students', *Frontiers in Psychology*. 141124095. Available at: https://doi.org/10.3389/fpsyg.2023.1124095.

Martin, L., Oepen R., Bauer, K., Nottensteiner, A., Mergheim, K., Gruber, H. and Koch, S. C. (2018) 'Creative arts interventions for stress management and prevention: a systematic review', *Behavioral Sciences*, 8(2), 28. Available at: https://doi.org/10.3390/bs8020028.

Mastroianni, A. M. and Gilbert, D. T. (2023) 'The illusion of moral decline', *Nature*, 618(7966), pp.782-789. Available at: https://doi.org/10.1038/s41586-023-06137-x.

McInnis, K. (2023) 'Campus racism: University of Manchester apologises over slurs in class', *BBC News*, 28 April. Available at: https://www.bbc.com/news/newsbeat-65410599 (Accessed: 12 June 2024).

Meyer, J. and Land, R. (2003) 'Threshold concepts and troublesome knowledge: linkages to ways of thinking and practising within the Disciplines', *ETL Project*. Available at: https://www.etl.tla.ed.ac.uk/docs/ETLreport4.pdf (Accessed: 3 September 2024).

Muller-Heyndyk, R. (2018) 'Students regret going to university', *HR*, 27 July. Available at: https://www.hrmagazine.co.uk/content/news/students-regret-going-to-university/ (Accessed: 11 June 2024).

Office for Students (2022) *Suicide prevention*. Available at: https://www.officeforstudents.org.uk/advice-and-guidance/promoting-equal-opportunities/effective-practice/suicide-prevention/ (Accessed: 30 June 2023).

Olaniyi, N. E. E. (2020) 'Threshold concepts: designing a format for the flipped classroom as an active learning technique for crossing the threshold', *Research and Practice in Technology Enhanced Learning* 15(1), 2. Available at: https://doi.org/10.1186/s41039-020-0122-3.

Osbourne, L., Barnett, J. and Blackwood, L. (2023) 'Black students' experiences of "acceptable" racism at a UK university', *Journal of Community & Applied Social Psychology*, 33(1), pp.43-55. Available at: https://doi.org/10.1002/casp.2637.

Plotnikoff, R. C., Costigan, S. A., Williams, R. L., Hutchesson, M. J., Kennedy, S. G., Robards, S. L., Allen, J. Collins, C. E., Callister, R. and Germov, J. (2015) 'Effectiveness of interventions targeting physical activity, nutrition and healthy weight for university and college students: a systematic review and meta-analysis', *International Journal of Behavioral Nutrition and Physical Activity*, 12(1), 45. Available at: https://doi.org/10.1186/s12966-015-0203-7.

Prospects (2021) *Nearly half of university students unprepared for employment*, June. Available at: https://www.prospects.ac.uk/prospects-press-office/nearly-half-of-university-students-unprepared-for-employment (Accessed: 3 September 2024).

Reilly, M. L. (2024) 'Study shows college enrollment falling with perceptions of its value', *Forbes*, 18 March. Available at: https://www.forbes.com/sites/meglittlereilly/2024/03/14/study-shows-college-enrollment-falling-with-perceptions-of-its-value/ (Accessed: 26 May 2024).

Sandrone, S. and Alavian, K. N. (2021) 'Threshold concepts in Neuroscience: identification challenges, educational opportunities and recommendations for practice', *Frontiers in Education*, 5. Available at: https://doi.org/10.3389/feduc.2020.540307.

Singh, M. K., Hu, R. and Miklowitz, D. J. (2021) 'Preventing irritability and temper outbursts in youth by building resilience', *Child and Adolescent Psychiatric Clinics of North America*, 30(3), pp.595-610. Available at: https://doi.org/10.1016/j.chc.2021.04.009.

Solís-Espallargas, C., Ruiz-Morales, J., Limón-Domínguez, D. and Valderrama-Hernández, R. (2019) 'Sustainability in the university: a study of its presence in curricula, teachers and students of education', *Sustainability*, 11(23), 6620. Available at: https://doi.org/10.3390/su11236620.

Srivastava, S. K. (2013) 'Threshold concepts in geographical information systems: a step towards conceptual understanding', *Journal of Geography in Higher Education*, 37(3), pp.367-384. Available at: https://doi.org/10.1080/03098265.2013.775569.

Tapera, R., Merapelo, M. T., Tumoyagae, T., Maswabi, T. M., Erick, P., Letsholo, B. and Mbongwe, B. (2017) 'The prevalence and factors associated with overweight and obesity among University of Botswana students', *Cogent Medicine*, 4(1), 1357249. Available at: https://doi.org/10.1080/2331205X.2017.1357249.

Telleria-Aramburu, N. and Arroyo-Izaga, M. (2022) 'Risk factors of overweight/obesity-related lifestyles in university students: results from the EHU12/24 study', *The*

British Journal of Nutrition, 127(6), pp.914-926. Available at:
https://doi.org/10.1017/S0007114521001483.

Wan Mohamed Radzi, C. W. J., Salarzadeh Jenatabadi, H., Alanzi, A. R. A., Mokhtar, M. I.,
Mamat, M. Z. and Abdullah, N. A. (2019) 'Analysis of obesity among Malaysian
university students: a combination study with the application of Bayesian structural
equation modelling and Pearson correlation', *International Journal of Environmental
Research and Public Health*, 16(3), 492. Available at:
https://www.doi.org/10.3390/ijerph16030492.

Wang, X., Hegde, S., Son, C., Keller, B., Smith, A. and Sasangohar, F. (2020)
'Investigating mental health of US college students during the Covid-19 pandemic:
cross-sectional survey study', *Journal of Medical Internet Research*, 22(9), e22817.
Available at: https://doi.org/10.2196/22817.

Westfall, C. (2023) 'Educators battle plagiarism as 89% of students admit to using
OpenAI's ChatGPT for homework', *Forbes*, 28 January. Available at:
https://www.forbes.com/sites/chriswestfall/2023/01/28/educators-battle-plagiarism-
as-89-of-students-admit-to-using-open-ais-chatgpt-for-homework/ (Accessed: 12
June 2024).

Yan, H. and Ke, Q. (2022) 'Moral education guides people to construct three dimensions of
a happy life and reduce emotional barriers', *International Journal of
Neuropsychopharmacology*, 25(Suppl 1), pp.A99-A100.

Yorke, H. (2017) 'One in five students regret their choice of university, new study shows',
The Telegraph, 20 January. Available at:
https://www.telegraph.co.uk/education/2017/01/20/one-five-students-regret-choice-
university-new-study-shows/ (Accessed: 26 May 2024).

Yuan, F., Peng, S., Khairani, A. Z. and Liang J. (2024) 'A systematic review and meta-
analysis of the efficacy of physical activity interventions among university students',
Sustainability, 16(4), 1369. Available at: https://doi.org/10.3390/su16041369.

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threshold concepts for life

Zhai, Y. and Du, X. (2022) 'Trends and prevalence of suicide 2017–2021 and its association with COVID-19: Interrupted time series analysis of a national sample of college students in the United States', *Psychiatry Research*, 316, 114796. Available at: https://doi.org/10.1016/j.psychres.2022.114796.

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