Piloting a well-being and resilience intervention in a course on digitalization for sustainability

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Abstract

Within computing education, developing sustainability competencies is still a fledgling learning objective.

In the International Summer School on Sustainability at Gothenburg University, we developed a course titled Digitalizatoin in a Changing World that emphasized the individual well-being and resilience aspect of individuals as a prerequisite for developing IT that serves the Sustainable Development Goals.

We piloted an intervention that had students explore a well-being practice and reflect on their daily state. The students' feedback in surveys and interviews indicates that those practices benefit their well-being and resilience.

We conclude the relevance of integrating mental and emotional health into university curricula in a field that develops the systems that run the world.

Keywords

sustainability well-being resilience computing education

1. Introduction

The field of computing education has slowly started to bring sustainability into the learning objectives of some courses [1, 2, 3]. Both the state of the natural environment as well as societal challenges in terms of well-being and resilience demand better integration of the development of sustainability competencies into computing education [4]. A concept that helps individuals better contribute to sustainability is resilience [5].

Building resilience implies working in six pillars, as explained by the psychiatrist Luis Rojas Marcos: Affectivity, self-management, self-responsibility, self-esteem, positivity and a vital purpose [6]. Issues and feelings of inadequacy are addressed via favourite spiritual and/or self-care practice, instead of patching them with consumerism from outside, then a lot of the environmental problems we see on the planet could be resolved more easily. If we humans learn how to better deal with self-worth and self-esteem, we are better prepared to take care of the world around us [7, 8, 9].

We set out to explore an intervention designed to support well-being and building resilience in the educational setting of an IT course focused on sustainability. The University of Gothenburg

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has established a month-long international summer school dedicated to Sustainability[1]. Each faculty contributes at least one course in order to have coverage of a large set of subject areas. The IT faculty is contributing a course titled "Digitalization in a Changing World" that the second author gets to teach. She decided to establish a well-being intervention with a reflective component as one central part of the course because (1) integrating mental health into sustainability education allows individuals to respond to sustainability challenges in society and natural environment from a place of resourcefulness, and (2) IT students have a responsibility to take care of their well-being and ensure personal resilience as future developers of the systems that to a large extent help run and administrate the processes that govern societal and economic interactions.

Research Question: How and to what extent do different practices, specifically meditation, yoga, breathwork and nature walks, impact students' well-being?

Contribution: We performed an intervention for well-being and resilience over one month and evaluated the impacts. On the quantitative side, we use validated psychological instruments to get insights into the changes participants experienced with regards to resilience, emotional intelligence, self-regulation, self-transcendence, and mystical experiences. On the qualitative side, we carried out and analyze exit interviews conducted after the last day of the intervention.

Impact: Running a pilot for such an intervention can provide a case for integrating mental and emotional health in a university context in an effortless way.

In the following sections, we elaborate on the study and reflect on the results and their impact.

2. Background

2.1. Sustainability connection to mental health

Within the dimensions of sustainability [10], the individual dimension was originally inspired by the mention of a "human" dimension by Goodland in the Encyclopedia of global environmental change [11]. This dimension speaks to the ability and capacity of an individual human to maintain and evolve themselves over the course of their lifetime. It refers to the well-being of humans as individuals. This includes mental and physical health, education, skills, knowledge, leadership, access to services, and personal values [12].

In a similar vein, Horlings [13] offers an "inner" dimension of sustainability that encompasses a personal dimension and a collective cultural dimension, and later on added how sense of place and values can support sustainable place-shaping [14].

For the reasons of both (1) mental health being inherently present in the individual dimension of sustainability and (2) the importance of personal sense-making for shaping sustainability transitions, the second author decided to establish a reflective well-being practice in the IT course designed for the International Summer School on Sustainability in Gothenburg.

2.2. Current state of mental health in SE

Stress and burnout have been extensively researched in the industry context. As early as the 1980s, Brod[15] came out with the term technostress in 1984 and described it as the resultant

[1]GU Intl. Summer School on Sustainability homepage

disease from the inability of people to adapt to the new computer technology. He examined the impact of computers on psychological attitudes, social relationships and the structure of social institutions.

Similarly, Ivancevich et al.[16] talked about occupational stress, attitudes and health among IS (Information Systems) professionals and explored perceived job conditions as stressful. Weiss[17] researched the sources of organisational stress on IS managers revealing a positive relation to psychological and physiological strains. At the same time, their results showed that IS managers have lower social support than other managers.

There are also theoretical proposals on occupational stress. One example is the one proposed by Thong[18], who analysed 12 occupational stress models. The result suggests nine key points to developing a theoretical framework of stress for IS professionals. In an attempt to examine the sources of stress, Sethi[19] categorised 33 primary stressors for IS employees and then associated them with seven factors, concluding that meeting deadlines was the primary source of stress. Moreover, Pawlowski[20], in a similar study, found that extended hours/workload, particularly in a project context, was the most mentioned stressor in the in-depth interviews of 20 IT professionals. Other interesting results obtained by Pawlowski were the identification of three consequences of burnout: reduced job performance, leaving the job/profession, and reduced physical well-being.

Regarding emotions, Sanchez-Gordon[21] performed a systematic literature review (SLR) of empirical studies on emotions. They identified 40 discrete emotions, the most frequent ones being anger, fear, disgust, sadness, joy, love and happiness. At the same time, this study gave a comprehensive view of the state of the art in emotions research in SE and emphasised that the participants came from industrial contexts.

In the same line, one of the most researched emotions has been happiness. Graziotin et al.[22] aimed to improve the quality of life and working conditions for Software developers by expanding the understanding of the happiness and unhappiness of software developers through a series of qualitative and quantitative studies. Their results showed that the highest impact of happiness and unhappiness is on development productivity and quality expressed by cognitive performance.

Some studies offer a comparative perspective taking into account other work areas. Nayak [23] applied a survey to 50 Software Professionals (SP) to measure their anxiety and compare it to a similar group of 50 Mechanical Professionals (MP). The results showed that SP presented higher levels of anxiety compared to MP. Among the same group of SP, individuals between 21 to 28 years old presented higher anxiety compared to the senior SP.

As mentioned before, these results are mainly in an industry context. What about universities? The picture is similar.

2.3. Mental health in university contexts

The American Psychological Association (APA) reported that student mental health is getting worse in nearly every metric [24]. According to the Healthy Minds Study and based on their data collection from >350,00 students at 373 campuses in the US between 2013 and 2022, the percentage of university students that met the criteria for at least one mental health problem is more than 60% [25].

Similarly, Danowitz and Beddoes [26] applied a survey that measured depression, anxiety, and somatoform disorders (psychological disorder that leads to physical manifestations or sensations in the body when a person is experiencing mental or emotional distress.) and identified individuals at high risk of suffering from Serious Mental Illness to students at California Polytechnic State University getting 800 responses. Their findings pointed out that respondents that screen for high risk of Serious Mental Illness is roughly 38% [26]. Considering the information from the Center for Behavioral Health Statistics and Quality of 2016, these results are higher than the estimated 4% of the US adult population that suffers a serious mental illness and more than double of the 17% of adults calculated to have a mental health condition overall. The authors concluded that, in general, engineering students have a higher need for mental health interventions compared to students from other areas. Another interesting point of these results is that Computer Engineering ranked highest in risk for serious mental illness when separated by engineering sub-disciplines.

Although these results could be strongly related to Cal Poly's specific context, engineering students in other universities may be in a similar situation. Similarly, studies in the United Kingdom have found a high prevalence of mental health problems among postgraduate students [27], [28]. At the same time, university health services in the UK report an increase in the demand for such services since more students present severe psychological problems [29, 30, 31]. In Australia, the student population has also been studied. Stallman compared university students' stress and anxiety levels with the general population. As a result, the students present higher percentages of stress. He studied levels of generalised psychological distress in students of two major universities in Australia, finding that 84% of them preset such symptoms, in contrast to 29% of the Australian general population [32].

Bringing the situation to the Swedish context, there needs to be more information about the mental health of university students in Sweden. One of the few studies carried out in Sweden with students from various university disciplines and programs was done by Vaez [33], who used self-administered questionnaires with a large number of full-time students. One of their conclusions was that stress in students has effects both on academic performance and on being prone to physical and psychological health problems. There are a couple of other studies outside of Sweden with engineering students, however, there are none that focus on SE students in the country.

2.4. Role of the universities in supporting student's mental health

A wide variety of initiatives and projects have recognised the potential of universities to promote and support mental health as well as provide help in self-identifying and managing stress in students through programmes [34, 35].

Efforts and interest in applying a health-promoting approach in higher education began in 1990. In 1998, the WHO published a book on health-promoting universities [36], giving legitimacy to the approach. The UK is an example of a country that adopted this approach; in 2006 the English National Healthy Universities Network was established to facilitate support for initiatives and activities to create healthy universities [37].

Rethinking learning environments to make them health-promoting, as pointed out by Orme [38], is challenging. However, we have to start somewhere; using the currently available

scenario and integrating mental health topics into the courses that are part of the curriculum seems natural.

3. Methodology

This section explains the research design, the instruments and the data analysis used in our study.

3.1. Research Design: Quasi Experiment

In order to answer our research question, we designed a one-month intervention as part of a course titled "Digitalization in a Changing World" at the International Summer School for Sustainability in Gothenburg, Sweden. It is a quasi experiment since participants were allowed to choose which option of the intervention to participate in. The ethical review application for the study[2] was approved by the Swedish Ethical Review Authority.

3.2. Participants: International Students

The population the participants came from was the student cohort of the Digitalization course. The 32 students included different education levels from first year Bachelor studies to final year Master studies and came from all over the world, including Sweden, Germany, UK, Austria, China, Japan, Thailand, South Africa, Russia, US, and Australia. All 32 candidates chose to sign up for the study.

3.3. Intervention: Well-being Practice & Reflective Journaling

The intervention consisted of daily at least 10-20 minutes of practicing one out of four well-being modalities: meditation, yoga poses, breathwork, or nature walks. Due to the different intensity levels of the practices, a shorter time frame of at least 10 minutes was recommended for meditation and breathwork and a longer time frame of at least 20 minutes was recommended for yoga poses and nature walks.

Participants were encouraged to choose a modality they did not already regularly carry out in order to be able to observe a potential effect over the course of a month of practice. For each modality, instruction and guidance was provided in one joint live practice with all the group together, as well as per audio and/or video guidance that the participants could watch or listen to in their own time when then continued the chosen practice on their own. All participants were encouraged to write a daily reflective journal entry on their feelings and thoughts brought up by experiences in a given day.

3.4. Data Collection

Data was collected at the beginning and end of the summer school using a survey and individual semi-structured interviews.

[2] in Swedish titled "En studie av effekter av välbefinnande övningar"

3.4.1. Survey

The survey is made up of five questionnaires that measure different areas of individuals. Below there is the description of each questionnaire.

Emotional Intelligence Intelligence has been studied for several years, mainly focused on the adaptaive use of cognition. More encompassing approaches have been proposed in recent years by theorist such as Gardner and Sternberg. Similarly, the publication of the book "Emotional Intelligence" by Goleman in 1995 popularised the notion of considering the experience and expression of emotions as a branch of intelligence [39].

Schutte [39] developed the Self-report Emotional Intelligence Test (SSEIT) taking as a base the revised Mayer and Salovey [40] model. The revised model covers four areas of emotional intelligence: emotional facilitation of thinking; appraisal and expression of emotion; perception; and understanding, analysing and employing reflective regulation of emotions and emotional knowledge to further emotional and intellectual growth [40]. Mayer and Salovey gave more emphasis in their model to the cognitive components of emotional intelligence, and at the same time, they conceptualised emotional intelligence with respect to potential for intellectual and emotional growth [40].

The SSEIT is a 33 self-reported item scale using 1 (strongly disagree) to 5 (strongly agree) Likert responses. The SSEIT items represent the following categories: utilization of emotions in solving problems, regulation of emotion in the self and others and appraisal and expression of emotion in the self and others.

Resilience Scale The are several ways to define resilience, for the study in hand, we use the definition by Herrman, understood as positive adaptation, or the ability to maintain or regain mental health, despite experiencing adversity [41]. Similarly, there have been several version of the resilience scale (RS). The first version had 25 items (RS-25), it evaluates the individual resilience degree through five personal characteristics [42]. This version has been translated to a different languages and it has been consistently reliable. The construction of a shorter version was the results of refinement studies, the final version consists of 14 items taken from the original version (RS-25) and was named 14-Item Resilience Scale (RS-14), this version has presented reliable internal consistency and external validity. The RS-14 measures a single construct of psychological resilience [43], all items are rated on a 7-point Likert scale.

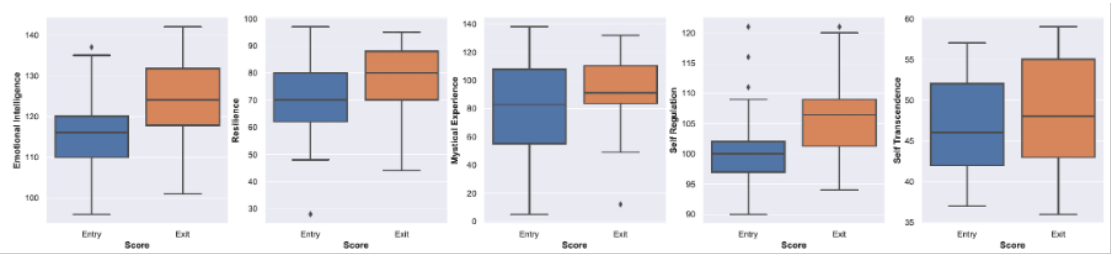

Figure 1: Entry and exit medians response

Short Self-Regulation Questionnaire Brown defined self-regulation as "the capacity to plan, guide, and monitor one's behavior flexibly in the face of changing circumstances" [44] p. 162. To assess self-regulation the Self-Regulation Questionnaire (SRQ) was designed by Brown, Miller, Lawendowski [45] in 1998, it contained 63 items. Later, based on this first questionnaire, Carey, Neal, and Collins [46] developed a 31-item version by conducting an exploratory factor analysis of the SRQ, named Short Self-Regulation Questionnaire (SSRQ). This last version is a self report measure of the individuals' ability to regulate behaviour to achieve goals. The SSRQ is a 5-point Likert scale: 1 (Strongly Disagree), 2 (Somewhat Disagree), 3 (Neutral), 4 (Somewhat Agree), and 5 (Strongly Agree), participants indicate to what extent they agree with the 31 items.

Self-transcendence Scale The term self-transcendence talks about expanded awareness, as well as, self-boundaries to dimensions greater than the self without devaluing the individual. Reed [47] explain that the are different ways of expanding self-boundaries, upward (reaching out a higher purpose or entity), inward (through finding meaning and self-acceptance), and temporally (integrating one's future and past into the present) [47]. There is considerable evidence that self-transcendece plays a crucial role in mental health. For example, it has been found that self-transcendence has a correlation or can be a predictor of decreased depression [47] and resilience and purpose of life [48]. At the same time, self-transcendence enhance quality of live or well-being in patients with serious illness [49].

To measure self-transcendence the Self-Transcendence Scale (STS) was developed by Reed. This scale has been adapted for use with adolescent, adult, and older adult individuals. Participants are asked to answered each item as it reflects in their current life.

Mystical Experience Questionnaire The operational definition of mystical experiences was provided by Stace [50] in 1960. It refers to the experience of profound unity with all that exists, transcendence of time and space, deeply felt positive mood, a sense of the experience of truth and reality at a fundamental level (noetic quality), a felt sense of sacredness and the difficulty to explain the experience in words [50].

Different versions of the Mystical Experience Questionnaire (MEQ) were developed based on the previous definition. The MEQ 43 is the most frecuently used; it contains 43 items. The last developed version is the MEQ30 (30-item revised Mystical Experience Questionnaire). This version contains four factors: transcendence of time and space, positive mood, ineffability and mystical. The MEQ30 is an instrument derived from MEQ43, psychometrically validated.

3.4.2. Interviews

We planned for brief exit interviews on the last day of the course. The choice was for only two prompts with the intention to keep the space wide open for exploration in whichever direction the participants wanted to share insights into their experience and the impact it had on them.

The two prompts for the exit interviews were: (1) to reflect on their experience with the well-being practice and what effects it had for them, and (2) to solicit feedback on what would have made their experience and practice better and if they had suggestions for improvement.

3.5. Data analysis

For the survey data, first, we ran the Shapiro-Wilks test to check whether the population distribution was normal. Subsequently, depending on the result of the Shapiro-Wilks test, we used the Wilcoxon test or T-test.

The qualitative data from the interviews were analysed using thematic analysis following Braun and Clark guidelines [51].

4. Results

This section presents the results of the survey and the interviews divided in two subsections. The first section contains the quantitative part and the second subsection the qualitative results according to the data analysis methods.

4.1. Quantitative results

We started out with 32 participants, 25 of whom completed the submission of their exit survey and therefore provide complete data points for the quantitative evaluation. Figure 1 shows the box plots of the five scales that formed the survey. There is a difference between the entry and exit surveys medians. The exit survey plots show an increment in all the scales. Nevertheless, the results of the statistical tests were only in a few questions of each scale, excluding the Resilience scale with no questions with significant changes. Table 1 lists the questions per scale and their P value.

The Emotional Intelligence test had the highest number of questions showing significant differences; questions 1, 2, 13, and 27 with p-values of 0.01881, 0.01614, 0.01972, and 0.008725, respectively. This suggests that the participants' level of emotional intelligence was related to their responses to these specific questions. Self-Regulation Questionnaire followed with two significant differences in two questions. The study found significant changes in questions 13 and 21, with p-values of 0.04 and 0.0176, respectively. Similarly, on the Mystical Experience Questionnaire, questions 13 and 15 had statistically significant p-values of 0.047 and 0.038, respectively. Finally, the Resilience scale did not show any significant changes in any of the questions.

4.2. Qualitative results

We conducted 8 exit interviews on the last day of the course. The interviews were just about under ten minutes. In order to gain a deeper understanding of the impact of this program on participants' experiences, a thematic analysis was conducted on the data collected through these participant interviews. Three themes emerged from the analysis: Mind-Body Connection, Group Environment, and Journaling. These themes provide insight into how participants experienced the program and highlight the key aspects that contributed to their overall sense of well-being. The following sections provide a description of each theme and present relevant quotes from participants to illustrate their experiences.

Mind-Body Connection This theme relates to the experience of participants' perceptions of their bodies and minds after performing a well-being practice. Students expressed feeling more connected, calmer, more focused and happier. Participants also commented on physical changes, such as reduced pain, improved sleep, and changes in mood. One participant notes that "a lot of the old pains I had in my shoulders and my back slowly started to become less over time when I used to do it every day". Comparably, another participant notes that "over time, I felt more happy, more like a lot of changes in mood and emotions".

Group Environment Regarding the experience of practising these activities in a group setting, participants find the group setting to be motivating and accepting. It contributes to their overall enjoyment of the activities. One student commented, "it's nice to have everyone else doing the same thing as you. It makes it feel a lot more accepting. It's more motivating". Another participant notes that "doing it in a group made it more motivating than maybe doing it alone," suggesting that there is a sense of community and support that comes with group practices.

Journaling This theme focuses on the experience of journaling and the benefits that come with it, such as improved clarity in thinking and expression. Writing a journal as part of the assignment had two opposite perceptions from the participants. On the one hand, participants mentioned the challenge of maintaining a daily journaling practice and finding the time to do it regularly. One student mentioned, "maybe rather than having to do every single day... I'm doing it like twice or three times a week or like just more than I would if that helps". Similarly, another participant commented, "you can write about anything pretty much. So it becomes kind of overwhelming. So you don't really know what to write," indicating that journaling can be challenging to start.

On the other hand, participants also noticed the benefits of this regular practice. One participant noted that "it made me a little bit more tired for bed and therefore I did actually go to sleep a lot easier". Other comments were around having a memory for the future, so they can re-read it and remember and reflect on the experience. Overall, participants found value in the act of journaling as a tool for reflection and improved clarity of thought.

5. Discussion

The survey's results show a slight change in every questionnaire and test applied. This outcome is expected since the study lasted only four weeks. The students' context also played a role. They were in a foreign country exploring and wanting to have new experiences, as expressed by several of them. Hence, several outside factors influenced the results, and it was impossible to measure them.

Regarding the qualitative data, interviewees commented on identifying changes after the study. In general, they felt calmer and more focused, with positive mood changes and even physical pain relief. Similarly, most participants mentioned their willingness to continue the practice after the course.

Table 1
items with significance

Question	P value
Emotional Intelligence:	
Q1.- I know when to speak about my personal problems to others	0.018
Q2.- When I am faced with obstacles, I remember times I faced similar obstacles and overcame them	0.016
Q13.- I arrange events others enjoy	0.019
Q27.- When I feel a change in emotions, I tend to come up with new ideas	0.008
Self-Regulation:	
Q13.- I usually only have to make a mistake one time in order to learn from it	0.04
Q21.- I set goals for myself and keep track of my progress	0.017
Mystical Experiences:	
Q13.- Sense of being at a spiritual height	0.047
Q15.- Feeling that you experienced something profoundly sacred and holy	0.038
Self-Transcendence:	
Q2.- Accepting myself as I grow older	0.034

Another common aspect was that many students expressed that doing the practices with others causes positive outcomes such as feeling accepted, feeling part of something bigger than themselves and sharing something meaningful with their classmates. The positive impact of participating in this type of group activities was also captured by the study previously carried out by Penzenstadler et al. [52]. Some others commented that they would look for places to continue the practice in a group. It is possible that the positive feelings of doing the practice in a group and a safe space influenced participants' decisions to continue the well-being practice later.

These findings are particularly relevant for motivating individuals to develop skills and engage in practices that promote emotional intelligence, mystical experiences, self-transcendence, and self-regulation. By understanding the specific items that are associated with these constructs, individuals can focus on developing those areas and potentially experience greater benefits in terms of their overall well-being.

It is important to note that the intervention in this study was relatively short and may not have been long enough to produce significant changes in the constructs being measured. This suggests that longer interventions or repeated interventions may be necessary to see meaningful changes.

Furthermore, the context of the study may have influenced the results. As the students came from abroad to participate in a summer school program, there may have been differences in their daily lives that could have impacted the outcomes of the study. This highlights the need for future research to consider the potential impact of contextual factors on the measurement of these constructs.

6. Conclusion

In conclusion, this 4-week intervention utilising yoga, breathwork, meditation, and nature walks as well-being practices and collecting quantitative and qualitative data, aimed to highlight the importance of integrating mental health into university syllabi. While the results were non-significant due to several aspects, such as the short intervention period and the novelty for students to be in a foreign country, it is clear that universities need to prioritise their students' mental health. The study highlights the potential of utilising these practices to improve mental health and well-being in students and provides a basis for further research in this area. Ultimately, universities should prioritise including mental health and well-being practices in their syllabuses to provide students with the tools and resources necessary to maintain good mental health throughout their academic careers and beyond.

Future work is foreseen to implement a more extended intervention with regular students. In addition, future studies could be conducted to investigate the potential impact of these practices on different populations. For example, studies could be performed on university students from various academic disciplines to determine whether the practices are effective across different student populations.

One crucial aspect for future interventions is incorporating participants' feedback to ensure the program is engaging and effective. From this first pilot, we collected important insights from students that will help our future programmes. Overall, future research in this area has the potential to provide valuable insights into the potential benefits of well-being practices for promoting mental health and well-being, and may ultimately help to inform the development of effective mental health interventions for a range of populations.

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References

[1] S. Mann, L. Smith, L. Muller, Computing education for sustainability, ACM SIGCSE Bulletin 40 (2008) 183–193.

[2] M. V. Palacin-Silva, A. Seffah, J. Porras, Infusing sustainability into software engineering education: Lessons learned from capstone projects, Journal of cleaner production 172 (2018) 4338–4347.

[3] C. Gomes, T. Dietterich, C. Barrett, J. Conrad, B. Dilkina, S. Ermon, F. Fang, A. Farnsworth, A. Fern, X. Fern, et al., Computational sustainability: Computing for a better world and a sustainable future, Communications of the ACM 62 (2019) 56–65.

[4] A. Redman, A. Wiek, M. Barth, Current practice of assessing students' sustainability competencies: A review of tools, Sustainability Science 16 (2021) 117–135.

[5] C. L. Redman, Should sustainability and resilience be combined or remain distinct pursuits?, Ecology and Society 19 (2014).

[6] L. Rojas Marcos, Superar la adversidad: el poder de la resiliencia, Espasa, 2010.

[7] Y. Mao, R. Yang, M. Bonaiuto, J. Ma, L. Harmat, Can flow alleviate anxiety? the roles of academic self-efficacy and self-esteem in building psychological sustainability and resilience, Sustainability 12 (2020) 2987.
[8] M. L. Harris, Ecowomanism: Black women, religion, and the environment, The Black Scholar 46 (2016) 27–39.
[9] R. R. Pillai, Balancing spiritual qualities leads to sustainability, in: Academy of Management Proceedings, volume 2018, Academy of Management Briarcliff Manor, NY 10510, 2018, p. 16361.
[10] B. Penzenstadler, H. Femmer, A generic model for sustainability with process-and product-specific instances, in: Proceedings of the 2013 workshop on Green in/by software engineering, 2013, pp. 3–8.
[11] R. Goodland, Encyclopedia of global environmental change, Wiley and Sons, 2002.
[12] C. Becker, R. Chitchyan, L. Duboc, S. Easterbrook, B. Penzenstadler, N. Seyff, C. C. Venters, Sustainability design and software: The karlskrona manifesto, in: 2015 IEEE/ACM 37th IEEE International Conference on Software Engineering, volume 2, IEEE, 2015, pp. 467–476.
[13] L. Horlings, The inner dimension of sustainability: personal and cultural values, Current Opinion in Environmental Sustainability 14 (2015) 163–169. URL: https://www.sciencedirect.com/science/article/pii/S1877343515000585. doi:https://doi.org/10.1016/j.cosust.2015.06.006, open Issue.
[14] S. Grenni, K. Soini, L. G. Horlings, The inner dimension of sustainability transformation: how sense of place and values can support sustainable place-shaping, Sustainability Science 15 (2020) 411–422.
[15] C. Brod, Technostress: The human cost of the computer revolution, Reading, Mass.: Addison-Wesley, 1984.
[16] J. M. Ivancevich, H. A. Napier, J. C. Wetherbe, Occupational stress, attitudes, and health problems in the information systems professional, Communications of the ACM 26 (1983) 800–806.
[17] M. Weiss, Effects of work stress and social support on information systems managers, Mis Quarterly (1983) 29–43.
[18] J. Y. Thong, C.-S. Yap, Information systems and occupational stress: A theoretical framework, Omega 28 (2000) 681–692.
[19] V. Sethi, R. C. King, J. C. Quick, What causes stress in information system professionals?, Communications of the ACM 47 (2004) 99–102.
[20] S. D. Pawlowski, E. A. Kaganer, J. J. Cater III, Focusing the research agenda on burnout in it: social representations of burnout in the profession, European journal of information systems 16 (2007) 612–627.
[21] M. Sánchez-Gordón, R. Colomo-Palacios, Taking the emotional pulse of software engineering—a systematic literature review of empirical studies, Information and Software Technology 115 (2019) 23–43.
[22] D. Graziotin, F. Fagerholm, X. Wang, P. Abrahamsson, What happens when software developers are (un) happy, Journal of Systems and Software 140 (2018) 32–47.
[23] R. D. Nayak, Anxiety and mental health of software professionals and mechanical professionals, International Journal of Humanities and Social Science Invention 3 (2014) 52–56.

[24] Z. Abrams, Student mental health is in crisis. campuses are rethinking their approach, 2022. URL: https://www.apa.org/monitor/2022/10/mental-health-campus-care#:~:text=During%20the%202020%E2%80%932021%20school,306%2C%202022).
[25] S. K. Lipson, S. Zhou, S. Abelson, J. Heinze, M. Jirsa, J. Morigney, A. Patterson, M. Singh, D. Eisenberg, Trends in college student mental health and help-seeking by race/ethnicity: Findings from the national healthy minds study, 2013–2021, Journal of Affective Disorders 306 (2022) 138–147.
[26] A. Danowitz, K. Beddoes, Characterizing mental health and wellness in students across engineering disciplines, in: 2018 The Collaborative Network for Engineering and Computing Diversity Conference Proceedings, 2018.
[27] H. Kerr, Mental distress survey overview, London: NUS services limited (2013).
[28] R. Psychiatrists, Mental health of students in higher education council report cr166; 2011, 2018.
[29] C. Blanco, M. Okuda, C. Wright, D. S. Hasin, B. F. Grant, S.-M. Liu, M. Olfson, Mental health of college students and their non–college-attending peers: results from the national epidemiologic study on alcohol and related conditions, Archives of general psychiatry 65 (2008) 1429–1437.
[30] O. Erdur-Baker, C. L. Aberson, J. C. Barrow, M. R. Draper, Nature and severity of college students' psychological concerns: A comparison of clinical and nonclinical national samples., Professional Psychology: Research and Practice 37 (2006) 317.
[31] B. D. Locke, K. J. Bieschke, L. G. Castonguay, J. A. Hayes, The center for collegiate mental health: Studying college student mental health through an innovative research infrastructure that brings science and practice together, Harvard Review of Psychiatry 20 (2012) 233–245.
[32] H. M. Stallman, Psychological distress in university students: A comparison with general population data, Australian psychologist 45 (2010) 249–257.
[33] M. Vaez, L. Laflamme, Experienced stress, psychological symptoms, self-rated health and academic achievement: A longitudinal study of swedish university students, Social Behavior and Personality: an international journal 36 (2008) 183–196.
[34] H. M. Stallman, Embedding resilience within the tertiary curriculum: A feasibility study, Higher Education Research & Development 30 (2011) 121–133.
[35] C. M. Kelly, A. F. Jorm, A. Wright, Improving mental health literacy as a strategy to facilitate early intervention for mental disorders, Medical Journal of Australia 187 (2007) S26–S30.
[36] A. D. Tsouros, G. Dowding, J. Thompson, M. Dooris, Health Promoting Universities: Concept, experience and framework for action, EUR/ICP/CHVD 03 09 01, World Health Organization. Regional Office for Europe, 1998.
[37] M. T. Dooris, S. H. Doherty, National research and development project on healthy universities (2009).
[38] J. Orme, M. Dooris, Integrating health and sustainability: the higher education sector as a timely catalyst, Health education research 25 (2010) 425–437.
[39] N. S. Schutte, J. M. Malouff, L. E. Hall, D. J. Haggerty, J. T. Cooper, C. J. Golden, L. Dornheim, Development and validation of a measure of emotional intelligence, Personality and individual differences 25 (1998) 167–177.

[40] J. D. Mayer, What is emotional intelligence? p salovey, dj sluyter,(eds.), emotional development and emotional intelligence, Basic Books, New York 3 (1997) 34.
[41] H. Herrman, D. E. Stewart, N. Diaz-Granados, E. L. Berger, B. Jackson, T. Yuen, What is resilience?, The Canadian Journal of Psychiatry 56 (2011) 258–265.
[42] B. F. Damásio, J. C. Borsa, J. P. da Silva, 14-item resilience scale (rs-14): psychometric properties of the brazilian version, Journal of nursing measurement 19 (2011) 131–145.
[43] G. Wagnild, A review of the resilience scale, Journal of nursing measurement 17 (2009) 105–113.
[44] J. Brown, W. Miller, N. Heather, Treating addictive behaviors, 1998.
[45] J. Brown, W. Miller, L. Lawendowski, L. Vandecreek, T. Jackson, Innovations in clinical practice: A source book, Sarasota, FL: Professional Resource Press/Professional Resource Exchange (1999).
[46] K. B. Carey, D. J. Neal, S. E. Collins, A psychometric analysis of the self-regulation questionnaire, Addictive behaviors 29 (2004) 253–260.
[47] P. G. Reed, Demystifying self-transcendence for mental health nursing practice and research, Archives of psychiatric nursing 23 (2009) 397–400.
[48] B. Nygren, L. Aléx, E. Jonsén, Y. Gustafson, A. Norberg, B. Lundman, Resilience, sense of coherence, purpose in life and self-transcendence in relation to perceived physical and mental health among the oldest old, Aging & mental health 9 (2005) 354–362.
[49] J. Neill, Transcendence and transformation in the life patterns of women living with rheumatoid arthritis, Advances in Nursing Science 24 (2002) 27–47.
[50] F. S. Barrett, M. W. Johnson, R. R. Griffiths, Validation of the revised mystical experience questionnaire in experimental sessions with psilocybin, Journal of Psychopharmacology 29 (2015) 1182–1190.
[51] V. Braun, V. Clarke, Thematic analysis., American Psychological Association, 2012.
[52] B. Penzenstadler, R. Torkar, C. Martinez Montes, Take a deep breath: Benefits of neuroplasticity practices for software developers and computer workers in a family of experiments, Empirical Software Engineering 27 (2022) 98.