

TECHNOLOGY STUDENTS' PERCEPTIONS OF LEARNING IN HIGHER EDUCATION

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ABSTRACT: *This study set out to probe students' thoughts regarding what engaged them to learn, what did not, and what they envisage an engaging future higher education to be in relation to the status quo. A journal writing activity based on two open questions was designed. Written responses were obtained from 17 bachelor students enrolled onto several technology study programmes. The qualitative data were catalogued and analysed from perspectives of technology, organisation, and pedagogy. The results showed that students' thoughts focus on the importance of active learning, with insights drawn from technology-related learning tools, organisational concerns such as physical environments and counselling support, pedagogical issues including motivation, lecture, and feedback. Possible interventional measures for effective engagement were discussed.*

KEYWORDS: learning, engagement, motivation, learner efficacy, student perception, student experience, engineering students, qualitative method, journal writing

INTRODUCTION

Signs of student disengagement in higher education have been reported in various institutions and across continents, which also greatly frustrated academics (McInnis, 2002). One undesirable drawback is that students' academic performance may be compromised. The causes have been explained to be societal changes such as market-driven values in university, delivery flexibility, online courses, as well as generational differences (McInnis, 2001). Generational differences were said to be reflected in perceptions of meaning of university education and in learners' behaviour (Krause, 2005). In an attempt to explain student engagement, the participation-identification model illustrated that learner participation in both classroom and school leads to greater success which in turn promotes a stronger sense of belonging and that further motivates more participation (Finn, 1993). Student engagement was also viewed as a multi-dimensional construct (such as viewing feeling and thinking as an inseparable entity of social life) to enable in-depth understanding of the student's learning experiences (Fredricks, Blumenfeld, & Paris, 2004).

Socio-cultural contexts affecting learner engagement have also been reflected. Factors resulting in student disconnection included academic culture, power within disciplines, and over emphasis on performativity (Mann, 2001). Institutional culture favouring mainstream students may alienate non-traditional students (Thomas, 2002). For instance, mature students (Askham, 2008), women with family commitments or employment (Christie, Munro, & Wager, 2005), and students of minority backgrounds (Johnson et al., 2007) may have to negotiate their identity fit and struggle with outsider experiences within the university culture. Students' social identity and their perceptions of learning community can also affect their learning in higher education. A stronger social identity appeared to be linked to a deeper approach to learning that strives for deeper understanding of knowledge and adhere more to underlying pedagogic intentions, which in turn benefited their academic performance. Students' perceptions of

learning community could act as mediators between their social identity and learning approaches (Bliuc, Ellis, Goodyear, & Hendres, 2011).

A more holistic perspective concerning student engagement in fact included their perceptions, expectations, as well as construction and experience of “being a student” (Bryson, Hardy, & Hand, 2009). In addition to obtaining qualifications, the concept of becoming ought to be part of the focus (Bryson & Hand, 2008). Engagement in this view was regarded as a construct consisted of different levels, including teaching staff’s discoursing with students, subject enthusiasm, the teaching process, and institutional resources such as classrooms that support both students and staff (Bryson & Hand, 2007). One criticism concerning the holistic perspective was that engagement and antecedents were not distinguished, as was the behavioural approach. Antecedents such as student expectations were found to affect student experiences (Christie et al., 2008), but these should be separated from the state of being engaged to allow for scientific understanding. Engagement was also proposed as both a process and a product that contrast what stakeholders do versus what learners do (Bryson, Cooper, & Hardy, 2010). An alternative view proposed by Kahu (2013) suggested student engagement as the outcome as opposed to factors impacting engagement as process (such as institutional factors); engagement concerned the individual psychological state of dimensions including affect, cognition, and behaviour, and engagement be not regarded as a process. Kahu’s framework illustrates factors influencing student engagement, embedding these processes within the social, political, and cultural context and with the student at its centre.

The present study explores higher education students’ perceptions of learning based on their learning experiences through reflective journal writing with the goals of uncovering what engages them to learn and what does not and what would work for future learning, as well as determining potential interventions and support required for increasing learner engagement and hence improving students’ learning quality. In particular, this study focuses on engineering students’ views concerning the role of technology in future learning. The assumption was that technology students are generally better equipped to make well-informed assessments of this compared to students of other subject domains. A qualitative approach is conducted to allow in-depth analysis as learner engagement involves multiple levels and hence not easily measurable by surveys (Bryson & Hand, 2008). This study employs the conceptual framework of engagement (Kahu, 2013) to target interventions for strengthening student engagement.

METHOD

Experimental design

A journal methodology was applied for this experiment. It involved the participants’ writing their views and opinions in a journal which was subsequently analysed using qualitative methods. Journal writing was a helpful tool for encouraging reflective activity in students (Dinkelman, 2000) and was beneficial for development of observational skills (Dyment & O’Connell, 2003). This journal approach is analogous to an interview, but with the major difference that the questions and scope of the discourse are given in advance, with no possibility for the researcher to intervene in the conversation beyond what is defined in the original questions. The motivation behind this choice of method was twofold: to approach the topic with an open manner allowing various issues to be raised by the participants (cf. Choy, 2014) and to be practical allowing the data to be collected as a natural part of the activities of the institution.

Participants

Seventeen students were involved in the study; six were females and the rest were males. They were 2nd and 3rd year bachelor students studying computer science, applied computer science, electrical engineering, chemistry, and construction.

Procedure

Data collection was carried out as a part of an elective communication course whose goal is to improve students' ability to communicate in both written and spoken English. The journals were written as part of the students' third graded writing assignment. The participants had to write the text individually of between 1,500 and 2,000 words.

Task

The students were asked to reflect over being a student in the current higher education system from his/her own perspective, especially what aspects are effective for his/her learning (for all courses) and what prevents him/her from learning, as well as imagining a dream scenario where they describe what changes should be made in University 2.0—the next generation of universities to improve their learning—and how they would experience the University 2.0. The dream scenarios could be futuristic but also should be realistic in that it should be based on technologies available today.

Analysis

The text was analysed using a standard qualitative methodology by first inspecting word clouds of the text, followed by coding of the text and organizing it into categories. The conceptual framework of engagement, antecedents, and consequences (Kahu, 2013) was employed to explain students' learning behaviour and factors affecting their learning, as well as deriving interventions needed for enhancing student engagement.

Ethical considerations

The qualitative analysis of the data was not conducted until after the course had finished, that is, the analysis was conducted after the coursework was graded. The first priority was for the writing activity to function as graded writing practice. Finishing the course prior to conducting analysis would ensure that any findings during the analysis would not affect the grading of the students. The students were informed of the possibility that their writings may be used as input for research and educational development activities. Next, all the writings were anonymized by removing all references to the individuals. The analysis was based on mostly aggregated data to prevent possible identification of individuals. Moreover, the topic matter is not considered as being of a sensitive nature. The study was thus adhered to the General Data Protection Regulations (GDPR).

RESULTS AND DISCUSSION

The responses from the students fell into three main categories: issues related to technology, organization, and pedagogy. This section is thus organized according to these main themes. It is also interesting to note the balance of responses for these categories. In terms of technology, only two comments were related to current state of technology, while 15 comments were related to the future of technology. In terms of organizational issues, 16 comments were related to the current state of organizations while 10 comments were suggesting future changes to the

organization. In terms of pedagogy and didactics, a massive 34 comments addressed the current state of affairs, only seven comments addressed future changes.

Although the nature of the current study is critical in nature, and should be, it is worth noting that several students made very positive comments such as “In my opinion there is no doubt that the standard and quality in higher education system in Norway is at an exceptional level”. Another commented that “Teachers friendly and helpful”. One student also reflected on higher education versus prior education emphasizing that teachers in higher education are specialized “experts” in their respective fields which is not the case in primary and secondary education.

Technology

As the cohort comprised technology students, it was expected that the students would have deeper reflections related to technology and education compared to non-technology students.

Status quo

Surprisingly, only two comments were directly addressing the current technology in use. One comment reflected over the lack of power outlets at the university. As students are expected to use their own laptops, the lack of power sockets becomes a problem towards the end of the day if the computer runs out of power. This student usually chose to go home instead where there were also fewer disturbances. As the battery capacity of laptops has increased drastically from a few hours one decade ago to become increasingly powerful, the issue of power sockets at universities is likely to be less pressing in the future. At the time of writing affordable laptops offer up to 25 hours of computer use on one charge. Using Kahu’s framework (2013), this student comment showed that structural influences of university (such as buildings and facilities) can affect learners’ engagement reflected in their enthusiasm and behaviour (time and effort). Psycho-social influences from university’s support also affects students’ motivation to work at the learning environment (Kahu, 2013).

Another student commented on the advantage of smartphones in lectures when used with kahoot. With Kahoot the students’ own mobile devices become a suitable infrastructure for conducting in class polls, quizzes, and anonymous questioning. The positive effects of Kahoot are also reported in the research literature, including increased concentration, sense of control, and social interaction (Licorish, Owen, Daniel, & George, 2018; Plump & LaRosa, 2017). However, disadvantages also exist especially in terms of limited content coverage and time constraints due to learning required and technologies setup. This student’s reflection indicated that some technology students were aware that game-based student response system may help increase fun of learning and provide a way for all learners (including the introverts) to participate and contribute to the learning environment. To enhance the psycho-social influences on student engagement based on Kahu’s framework (2013), the university teaching staff may consider integrating course content with gamification strategies to enrich students’ learning experiences, including constructing challenging problem-solving tasks in stimulated visual-audio environments and allowing friendly competition combined with concept exploration and supporting students’ metacognition by providing timely feedback.

Future perspectives

Not surprisingly, the technology students had many suggestions about the use of technology in learning in higher education in the future. The reflections can broadly be defined as addressing specific technologies and services. Several students mentioned virtual reality (VR), 3D and

simulations, robot tutors and chatbots, and artificial intelligence. These are technologies that are available currently.

Virtual reality is already used in teaching of science (Mintz, Litvak, & Yair, 2001), practical engineering skills (Häfner, Häfner, & Ovtcharova, 2013), and elementary level skills such as street crossing (Josman, Ben-Chaim, Friedrich, & Weiss, 2008) and pedestrian safety (McComas, MacKay, & Pivik, 2002). Three dimensional visualisations (Sandnes & Eika, 2017a, 2018c) have been used in engineering education for a long time. Educators are also exploring the potential of augmented reality (Sandnes & Eika, 2017b; Sandnes & Eika, 2018a; Sandnes & Eika, 2019). The students' reflections indicated that visual enhancement helps engage students and they expect such practice in future learning environment. It is evident that psycho-social influences from university teaching practice by means of virtual reality and three-dimensional visualisations increase students' level of engagement, and structural influences from university policies should support the teaching staff to achieve this.

The idea of having a robot tutor was also mentioned by several students, such as a type of CP3PO that monitors the students' progress, makes suggestions, and never gets tired. Chatbot technologies are available and the technology has also been explored for teaching purposes (Bii, 2013) such as language teaching (Jia, 2004). This comment seemed to suggest that students wish to be independent learners in future learning scenarios, able to self-regulate their pace of learning and self-monitor and evaluate their own learning outcomes. As students' expectations and involvement (as antecedents) had a crucial role in student engagement, and their behavioural engagement also fostered self-efficacy and self-respect (Bowden et al., 2019), fulfilling this wish of independent learning would satisfy their psycho-social needs and motivate them to develop their skills. As also found, autonomy-motivated learners were encouraged by teachers who support learner autonomy, and learners' self-efficacy was in turn strengthened (Duchatelet et al., 2019). A foreseeable intervention would be for the teaching staff to be supportive of learner autonomy in extracurricular activities in addition to creating active in-class student-centred learning environments that foster student autonomy and involvement, as well as structural support from university policies to strengthen the support system.

Another interesting suggestion was sensors that adjust the temperature and air quality. One would assume that such technology is already present in modern buildings, but this is an expression that some students experience poor physical environmental conditions. Indeed, controlling such environmental conditions is challenging in small spaces occupied by large crowds that often move around. This student comment indicated that structural influences such as physical building and classroom could affect learners' emotions and health during learning situations. It is thus vital as an intervention measure that structural quality of university buildings and classrooms be of good standard to address students' health concern, which was revealed as one of the prominent external pressures of students (Yorke, 2000).

The most futuristic suggestion was the ability to download courses directly to the brain. A science fiction scenario where knowledge and skills can be directly uploaded to the brain would render higher education institutions as we know them obsolete. If courses can be directly uploaded to the brain, if this would be engaging to the learner, then there is no need to attend class any more, which may save time and travel; still, other skills such as interpersonal communications and real-life skills such as driving may require practising and interacting in real-life situations. In this scenario, the individual psychological state of emotion, cognition,

and behaviour would likely become more private (if not completely hidden), and their relationships with peers, teaching staff, and institutions would also likely become more distant. Still, even if it would be possible to execute direct brain-upload courses, further development courses may be needed to consolidate students' learning outcomes. As of now, online communications seem to be on the rise because of the current pandemic, the variables that influence student engagement (i.e., university, relationships, and student variables) are likely to differ from those of conventional learning environments. Future research on influencing variables would be required, for instance, student variables such as motivation (Ormrod, 2010), personality (Poropat, 2009), and self-theories (Yorke & Knight, 2004).

An interesting comment was for the physical student cards to be replaced by bracelets or a smartwatch app. The student cards are used to gain access to various areas within the university to prevent individuals not connected to the university access as the university is located in the city centre. This comment suggests that students wish to have easy access to the learning environment, which may be urgent especially when students face time pressure during personal difficulties. One may also argue that an additional student card may easily be lost, which adds to additional pressure of having to replace a new one. This student reflection shows that structural factors involving university policies such as student cards may also influence students' engagement. According to Zepke, Leach, and Butler (2011), not all factors may strike constantly but it may affect students unexpectedly. An intervention may thus be to allow exceptions during times of difficulties for individual students.

In terms of services many students commented on the need for more live streaming and recording of lectures and online videos. Many students need to take part time jobs to support their studies or have responsibilities for children, and online lectures provide the students with more flexibility. One student pointed out that videos facilitated easier review of the curriculum. The use of online videos has received much attention among educators (Fardon, 2003; Burnett & Meadmore, 2002). Other topics in relation to online videos include MOOCs improved organization of information on the university website. This comment indicated that students regard having flexibility as useful for their learning and living as students since other obligations may concurrently be involved. Fulfilling this desire would release at least some of the so-called "lifeload" pressures (Yorke, 2000) that a student may have. An intervention would likely be offering flexible courses where video recordings are available.

One student pointed out that it was "easier to use google than spending time consulting the teacher". Search engines are already an integral part of students' learning strategies, yet this is perhaps not reflected in the current pedagogical practices. Several educators have addressed search engines and learning (Anghelescu & Nicolaescu, 2018; Tsai & Tsai, 2003; Duffy, 2008). To promote self-regulated learning where learners exercise self-control over cognitive processes such as actions and thinking (Zimmerman & Schunk, 2001; Richardson et al., 2012), an immediate structural intervention (Kahu's framework, 2013) would be to include more learning sessions of search techniques as university policies of learner support, thus also strengthening psycho-social needs of learner motivation and self-efficacy (cf. Yorke & Knight, 2004).

The future visions for technology use in education are perhaps as ground-breaking as one may have expected from technology students. Yet, to ideate around new and previously undefined concepts require some methodology and training (Sandnes, Eika, & Medola, 2018).

Organization

In this study organization is used as an umbrella term to refer to issues related to resources, infrastructure, funding, schedules, and demographic profiles.

Status quo

One of the most pressing issues mentioned was that of infrastructure, in particular, physical space. The issue of space and places to study on campus is a challenge for many higher education institutions in Norway. Several students mentioned issues such as limited spaces, bad air quality, outdated equipment and facilities. For instance, one student wrote:

I am now in my third year and I admit I have somewhat ambivalent feelings surrounding the learning environment and the skills I have developed throughout the study. The building is often crowded and poor lit, which does not pair well with the *anonymised country* autumn/winter darkness. The physical aspect of the building where most of my classes are in, is not inviting and it feels heavy, sometimes even claustrophobic. I found myself often seeking reading places outside the university campus where there is better ventilation and light.

Despite these dystopic descriptions of the learning environment, several students also quite positively described the benefits of the local makerspace and the labs allowing students to experiment with 3D printing amongst others. One student also commented on the consequences of being located in the middle of the city:

The fact that *anonymised institute* is in the middle of centrum for me is a disadvantage. Being close to shopping area, always hearing the tram for me is a distraction from learning. It would be nice if there was more of a university feel to the campus itself. As a computer science major, we are mainly in one building and at the end of the road. If all buildings were to be together, one could get a better sense of togetherness and hopefully it can help with the distractions.

These students' reflections indicated that physical-structural influences such as buildings, facilities, spaces, locations, as well as the surrounding environments, where students could study and discuss and do their coursework, are crucial in boosting student engagement. These factors also influence students' health, their interactions with peers and teaching staff, and their sense of belonging (feeling part of the learning community). This physical-structural factor appears to be lacking in the conceptual framework proposed by Kahu (2013), or not specified but should perhaps be included as part of the structural influences contributing to learner engagement.

A consequence of the rather pressed real-estate situation is the challenge in making suitable time schedules. Often, time-schedules are resulting from compromises due to too few rooms, instead of supporting good pedagogical practices. One student pointed out that the poor administration of such resources affects the students' motivation. One possible solution of the limited real-estate situation, which is unrealistic to change overnight, would be to make more use of digital learning. In so doing, however, other consequences may emerge, such as restrained interactions with the learning community (cf. Lear, Ansorge, & Steckelberg, 2010) and with teaching staff which was considered the crux of the learning situation (Smith, 2007).

The university in question has diversity as one of its key strategic values. One female student discussed challenges associated with being a woman in engineering education. This reflection seemed to echo what was felt as female alienation within male-dominant university culture (cf. Fraser, 1994). One possible interventive measure would be to build an inclusive pedagogy (using the terms of Grace & Gouthro, 2000), where gender differences are addressed and hence inequitable treatment may be eliminated. Another student was an immigrant who described how language issues affected his learning. He had learned *anonymise language* during his time in *anonymised country* but felt that it was challenging to meet requirements to use English in the various learning situations. As a non-traditional student, the learner may have experienced other challenges prior to university environment (such as renegotiating social identity). Hence, one possible intervention may be to offer learning support where academic skills (including language skills) may be enhanced through group or individual coaching, thereby satisfying psychological and social needs in the process of fostering self-efficacy. Another issue pointed out by one student was the increasing number of newly recruited teachers who do not speak *anonymised language* and that it was hard to understand their accented English during lectures and supervision. Despite that diversity is hailed as invaluable asset, non-conventional students faced challenges concerning identity and language. Non-conventional teaching staff may also experience similar challenges, though their response was not solicited. From the perspective of enabling student engagement, it would be reasonable to offer language courses as teacher support.

Several students mentioned the issue of funding. Public higher education institutions in *anonymised country* do not charge tuition fees, and students are eligible for a governmental loan and stipend. However, this allowance has not changed much over the years and is insufficient to cover all living expenses in the capital. Consequently, most students choose to take a part time job. The job often takes attention away from the studies. A couple of students also pointed out the expenditure of purchasing course books, and that the library should make more books available to students (assumedly the students want the same titles all at the same time). An obvious interventive measure is for the student funding to be adjusted such that it reflects the actual cost of living in *anonymised city*. Issues related to student funding are governed at ministerial level and beyond the control of the university leaders and its educators. The students' reflections related to funding and cost seemed to suggest that the wider political, economic, and socio-cultural perspectives also influence students' engagement, hence corresponding to Kahu's (2013) conceptual emphasis on the political and socio-cultural contexts in which the process of engagement was embedded.

One student acknowledged the university's recent strategic focus on increasing research and research-based teaching. As the student put it:

Anonymised university is going in the right direction with focusing on research. Although I am not part of any research group, it is a benefit for students who want to enroll in master's or PhD programs have the opportunity to participate in research projects and become part of the technological development which can be later applied in different aspects of society.

This is encouraging and in line with our recent efforts to include bachelor students as active researchers (Sandnes & Eika, 2018b; Sandnes & Eika, 2018d; Sandnes, Eika, & Medola, 2018). Using Kahu's (2013) terms, this student's reflection seemed to indicate the individual

engagement which in turn had proximal consequences such as academic achievement and social satisfaction, and distal consequences such as work success and active social citizenship.

Future perspectives

Organizational issues mostly reside on the institutional level and cannot easily be resolved by an individual student or educator without the support of the leaders. One way to achieve change is to speak up and report issues. One student mentioned that he had written a letter to the university board (the highest organ in the University) about an issue, but without anything happening. One intervention would be to make students aware of the variables within their own control, in this case, possibly the student union as structural influences where issues could be forwarded and discussed on behalf of individual students.

Students' future visions in terms of infrastructure included the removal of the traditional libraries in exchange of more working area. As one student wrote:

I wish that for the future that we could get rid of on-campus libraries. Not because I don't like them, but for the potential of space. If we got rid of books and replaced them with more tables and chairs that had screens on each table, it would eliminate that space issue.

Another student suggested that the library should be divided into a silent section and a section where talking is allowed. The reflections regarding libraries suggested that individual students make use of libraries as socio-learning areas, and some with preference of more electronic resources, indicating that structural modifications may be considered and implemented to address such needs. An addition concerning physical learning areas (buildings or zones) to Kahu's (2013) framework would strengthen this element of structural influences on learners' engagement involving self and group learning.

The future was also described in terms of physical environmental improvement to facilitate learning, as envisioned by one student:

I can envision green roofs, where the students can go out and take a deep breath when they feel overwhelmed and where social interactions could flourish outside the classrooms. Good ventilation would also be a priority for the school, as well as better lighting, using available technology to provide with inner lighting which simulates sunlight.

This student reflection again concerned physical environmental impact on learners' physical well-being as well as potential psychological stress, including classrooms, lighting, and air quality. This issue seems to confirm the need to address the structural influences such as facilities of buildings to enhance students' socio-cultural learning.

Digital access for everyone was also raised as an issue. Some comments evolved around the students' well-being. One student called for a shift towards the individual where the university is more personal. One specific suggestion was the provision of drop-in counsels. One student also called for the university to provide a general course on study technique and how to concentrate. These reflections appeared to address learner needs in all regards. A feasible intervention would be to offer individual counsels through university policies. These reflections also seemed to correspond to the psychosocial influences where university support

may cater for students' needs to be motivated and learning/academic skills acquired, as already proposed by the framework (Kahu, 2013).

One voice was also calling for a greener and more sustainable future as well as reducing students' financial burdens, hence providing possible solutions for certain economic sectors and addressing students' needs:

The food prepared in the canteen should ideally come from overflow products from the stores which would normally be thrown. The university should enter some sort of "dumpster diving" deal with local food stores where stores provide at low price products which they normally throw away for various reasons. That way, the students could buy cheap food and contribute to battle food waste, which is quite prevalent in *anonymised country*.

Another student wrote: "Also, more plant-based options would be available at the canteen and less products where production leaves a big carbon footprint." As it happens, the organization running the canteens at the University already has implemented some of these ideas; possibly this may not have been communicated well enough to the staff and students. Still, this comment reflected the student's concern over environmental issues, again seemingly suggesting that physical environments indeed ought to be included as part of the Kahu's framework (2013) addressing learner engagement.

A few students addressed issues related to the organization of courses. As one student wrote "I feel we have too many courses and assignments which are due at the same time and I always must make some courses priority, while focusing less of my attention on some others." Another student called for a reorganization based on courses in sequence rather than in parallel:

I propose a structural reform. The courses should be divided into modules. Let's say we have 3 subjects each semester. The students would take one course at a time and an exam would follow immediately the completion of the course. That way, there won't be an extended time gap between the lectures and exams.

There are, however, several pedagogical consequences of such a change, not all beneficial. These reflections also suggest varied individual preferences, which may be hard to satisfy concerning curriculum and assessment. One remedy may be to seek dialogues between students and instructors where due dates of assessments between courses are close. It is thus advisable that instructors show understanding and flexibility during such situations. As suggested, one crucial element of the learning situation is learner relationship with staff (Smith, 2007), and hence it is vital to maintain the open communication between students and instructors to ensure the positive psychosocial influences.

Pedagogy

The students' responses yielded most opinions regarding past and present issues related to pedagogical practices at the university while fewer responses addressed future perspectives.

Status quo

One student reflected over the pros and cons of the freedom and flexibility versus structure at the university which raised the temptation of skipping classes. Another student praised the fact

that some assignments were mandatory in certain courses. Many of the comments were related to students' motivation for studying. One student expressed an impression that the university had more focus on deliveries and deadlines as opposed to learning. Another pointed out that it was hard for students to motivate themselves. They consequently did not attend lectures which were not compulsory and instead stayed at home and ended up not working on the curriculum. Another student pointed out that some students had mental health issues such as depression which greatly affected motivation. These reflections seemed to indicate that students appreciated greater freedom of learning at university than prior educations but at the same time experienced difficulty motivating themselves because of natural tendency or personal issues. Mandatory assignments were considered helpful, suggesting that in the midst of allowing learners freedom to choose, structured requirements—including attendance—may in fact assist learning. Thus, the view that learners should be exposed to opportunities to learning to express themselves (Kuiper, 2018) may be closer to addressing learners' needs as opposed to the view that course assignments inflict burdens onto learners and teachers (Macfarlane, 2017). One intervention would thus be to construct both optional and required courses, with certain required assignments, as already was the case in most degree programmes.

The value of interaction between student and teachers was appreciated as opposed to one-way communication. Teachers as “rock stars” were viewed as a key to motivating students. One student even reflected that technology, infrastructure, and buildings were not important, but student-teacher interaction was. It was pointed out that teachers need to be available and that teachers need to be engaged in the subject in order to challenge the students and evoke discussions. These reflections indeed confirm the importance of teachers, teaching practice, and their role in engaging students (cf. Pascarella & Terenzini, 2005).

Students' intrinsic need derived from challenging circumstances could also serve as motivation for personal growth. As reflected by one student, being from a different cultural background and with little education and with no-one believing in the student actually motivated the student to work hard and eventually overcame many difficulties. This reflection seemed to agree with the previous study that personality and self-belief contributed to personal success (Poropat, 2009; Yorke & Knight, 2004).

The lack of motivation was also associated with lectures. As one student put it: “I cannot say I have often sat in a class and felt inspired or motivated to learn more.” Other recognizable self-explanatory statements included that “teachers still use the 10 year-old ppt (PowerPoint) presentations in black and white text only”, “teachers stand in front of the classroom”, and “I have come to the realisation that I learn minimally by listening to a presentation and taking notes”. These reflections suggested that students had different instructional preferences, which may have to do with their own learning styles. As previously research indicated, some students processed information more efficiently based on visual cues while others more based on verbal stimulus, also some tended more towards interactive learning as opposed to independent learning (Felder, 1996). As learner-specific characteristics are a natural part of all learning situations, there may be no best approach that would fit all kinds of learner preferences. One strategy may thus be to vary and include all teaching approaches as required or as often as one can.

Smaller classes may somehow help individuals with different preferences and could be suitable for different purposes such as holding presentations and promoting alertness. As one student reflected:

From my perspective, being a student in higher education has been an impersonal, self-reliant and often lonesome experience so far, and I don't feel like the universities are not doing enough to mitigate this. To start off, I am not fond of the traditionally crowded lecture hall. Listening to a professor's unspirited monologue and taking notes from a slideshow presentation makes me feel disconnected from the curriculum and is not an effective way for me to learn. I've really grown to appreciate the smaller courses, in smaller classrooms, where tuition is more akin to the one you would typically find in high school. Smaller classes with proactive teachers have been the most enjoyable and effective ones, being invested in what is being lectured and having to participate in class has forced me to stay alert and listen. A smaller class also makes it easier to hold oral presentations, which I would love to do more of. Doing presentations is both fun and requires me to learn a subject good enough for me to be able to speak freely about it.

One student even went as far as stating that the lectures available online have made the traditional lectures obsolete and that a teacher's role be reshaped as that of a supervisor:

Electronics and IT engineering is composed of many technical subjects for which there are numerous online free lectures. In my opinion, this makes school lectures obsolete and outdated. I think the school should outsource the lectures to the internet and use the professors in a much more efficient way which I will explain in more detail. Rather, a professor could have open office hours instead, where students could receive clarification on something they've already started working on.

Other perspectives on traditional lectures included threshold for asking questions in large classes; as a result, the lack of interaction in large classes called for smaller classes. On the other hand, one student also defended the lecture's importance: "recently had a course where there were no lectures. This was very frustrating as I had to rely heavily on other students knowing the subject from beforehand." Another student wrote "I miss teachers who show interest in the development of the students and how the students can link what they have learned to real life scenarios". These reflections concerning inspiration and motivation through lectures are consistent with the finding where such feature is regarded as the most important of good lectures (Jian, Sandnes, Huang, Huang, & Hagen, 2010b).

One IT student made an interesting description of his realisation of the power of reflection over rote learning:

From my years of studying IT I have spent numerous hours solving different math and coding exercises asking for a single answer with two lines under it. I don't remember any of these exercises. The exercise I remember the best, that made me think, was in a subject called *anonymised course (XXX)*. The professor showed us a cooking top and asked where the switches should go, and which switch should go to which cooking plate. Rather than give an answer, the professor engaged with us students and asked us to defend our position. Consequently, teaching us to reflect, think outside the box, and rethink over our stance. This is a skill that may be utilized numerous ways in life, both during and after an education.

Several comments were well-aligned with the ideas of socio-cultural learning. As one student wrote about teamwork: "Focus on group work has changed the mindset to working in teams and collaborate and contribute." Another student remarked about student assistants: "In my opinion, teacher assistants in courses is a genius inclusion. They can often relate to us students, as they have completed the course recently and/or are students themselves, making it easy to ask and get help from them." The benefits of student assistants were echoed by several students, yet one pointed out that they became too busy during the announcement of assignments. The system with sponsors, that is, experienced second and third year students helping freshmen students, was highlighted as highly positive. This helped students more quickly make friends who became collaborators in subsequent obligatory group assignments. But, as one student put it: "Problem is that these 'Friends' dropped off gradually, and eventually (I had) no one to work with".

Yet, there were also some criticisms of teamwork:

We have many assignments which are to be made in group, and that can be challenging. While it is useful to share the workload with group members, I feel we could be receiving a lot more input from the teachers when we are working on these projects. Good cooperation has to do with shared goals and a common set of rules, which are not always developed naturally. I believe some guidance from the teachers, both on the academic part of the project, but also on group dynamics, would be welcomed by students.

Another student reflected over challenges in group work where project partners did not live up to one's standard.

The students' reflections concerning class size that affected student-teacher interactions, the importance of lectures, and socio-cultural learning such as learning through student assistants and teamwork indicated that the students appreciated and recognized the multi-dimensional roles that a teacher plays over the course of their learning. Teachers may function as a proactive facilitator who enthusiastically engage students in their learning tasks (corresponding to Kahu's factors of interest and cognition, 2013), as a provider who gives information in terms of subject knowledge in class lecturing and outside class advising, a practical guide who gives insight in handling group dynamics, and a mentor who shows interest in students' development that satisfies learners' emotional need (corresponding to Kahu's affect factor). All these factors could contribute to students' behavioral change that would bring about deep learning (corresponding to Kahu's behavior factor, 2013). Contrastively, a quantitative study suggested that students regard teamwork as most important while teachers as less important (Jian, Sandnes, Huang, Huang, & Hagen, 2010a); the mid-to-low ranking of teachers is also echoed in other studies (Jian, Sandnes, Huang, Cai, & Law, 2008; Sandnes, Huang, & Jian, 2006).

Technological subjects have a substantial element of practice and laboratory work, and the positive effects of practice are echoed by several students. Relevance in terms of links to working life and excursions was also mentioned as important. The issue of excursions was particularly noticeable among biotechnology students. These students' reflections agreed with the previous research in that students tend to be pragmatic and prefer work-related experience and techniques while theory/facts are less preferred (Jian, Sandnes, Huang, & Huang, 2010).

Student evaluation is a much-discussed topic among educators, and issues related to evaluation (i.e., the assessment of students) were also addressed in the students' comments. Clearly, the mechanisms that affect the students' grades are of interest. One student pinpointed the classic evaluation discussion in a single comment: "Students wouldn't be tested on a single sheet of paper with a couple of questions, rather they'd be tested on practical exams where they have the possibility to showcase how much they have managed to learn throughout the year". Others also praised portfolio evaluation as a better alternative to the traditional school exams as students get formative feedback and spread the risk throughout the semester. The importance of feedback was echoed by several voices. The issue of what aids that are allowed in exams was also highlighted. One viewpoint was that by moving from traditional school exams to evaluation forms that are more similar to the actual situations faced in the profession, the discussion of aids becomes irrelevant because a profession is conducted with relevant tools.

Future perspectives

In terms of views on issues related to pedagogical practices of the future, one student called for eliminating courses that are not part of the future, but instead preparing students for the future needs after graduating. This recognizable comment reflects a somewhat simplistic view of the world. It is hard to disagree with the goal to educate to best fit the needs of future employment. Yet, professions and working life are under constant change and what is relevant today may not be relevant tomorrow. This calls for the curriculum to include some general skills that are independent of current trends, especially the ability for students to learn throughout their career after they have graduated (Day, 2002).

Another student called for processes that promote learning and less on practices that punish mistakes without the means to learn from and correct mistakes. Some students called for more flipped classroom (Tucker, 2012) and variations on the flipped classroom approach.

Two elements, which were reflected upon over past and present pedagogy, were also considered as important features of future pedagogy: teacher feedback and practice. The responses indicate that students want the amount of teacher feedback to improve, as one student wrote: "I've personally learnt to appreciate good feedback as it is tremendously helpful in preparing you to try again, and do better." Concrete suggestions include mid-term evaluations and more in class participation. The need for sufficient feedback is consistent with views expressed in the pedagogical literature (see Brinko, 1993). The reorganization of courses to achieve an increased focus on practice (Edmond, 2001) and practical methods is also mentioned as important for the future.

Finally, several students voiced the need to make it easier for bachelor students to become involved in research projects. These students also suggested that it helps to highlight the perhaps lesser known profession of being an academic and conducting research, as opposed to other known professions.

These reflections concerning future pedagogy suggest that over time the students have grown to appreciate the importance of informational insight obtained from instructors and from practice. Some more engaged students would even wish to be part of a research project, despite not yet being classified as research students. An immediate challenge and need for teachers would then be to be able to engage the less engaged students by executing the multi-

dimensional roles in the different contexts, hence fulfilling factors contributing to learner engagement in terms of interest, affect, cognition, and behavior (cf. Kahu, 2013).

Limitations and future research

This study employed the students' journal writing to probe what engaged them to learn, what did not, and what they would envisage a future engaging education to be. The findings were analysed from the perspectives of technology, organisation, and pedagogy. The advantages were that the students' responses were retrospective and reflective, uncovering their learning style and preferences in relation to the current educational system. Future research may investigate whether students' learning style is correlated with motivation, lecture style, and achievement, as well as their cultural relevance. Still, one may ponder whether the students' views expressed through their responses are biased or shaped through their encounters with various questionnaires, course evaluations, and the university in general. It may also be relevant in future work to repeat a similar exercise where students have to ideate over the concept of a future university. Instead of being an individual essay-type activity, it could be based on a systematic team ideation process using a design thinking methodology.

CONCLUSIONS

The current study attempted to probe students' general view of status quo of higher education and their views of how higher education should be in the future to improve the learning experience. Qualitative data were collected using a writing activity with two open questions. The findings revealed central issues related to active learning from perspectives of technology (e.g., using Kahoot, virtual reality, simulations, and robot learning tools), from organisation (e.g., involving physical environments such as buildings and libraries as well as facilities such as counselling and skills support), and from pedagogy (motivation, lectures, student assessment, and feedback). Interventional measures for improved engagement were also discussed.

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