Promoting Classroom Engagement Through the Use of an Online Student Response System: A Mixed Methods Analysis

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ABSTRACT

The use of online student response systems (OSRSs) is increasing within tertiary education providers, however, research investigating their potential to enhance student engagement is limited. The aim of the current study was to examine the impact of an OSRS using an experimental crossover design. Quantitative data measuring student engagement was compared from pre- to post-intervention. A qualitative analysis was used to further investigate student perceptions of the OSRS. The results from this study suggest that OSRSs may be appropriate tools to increase student engagement in undergraduate statistics classes. Despite no significant change in engagement scores observed when students were exposed to the OSRS than when they were not, students appreciated the novelty of the OSRS and perceived it to have had a positive impact on their learning experience. Suggestions for how to exploit the advantages of OSRSs and directions for further research are discussed.

KEYWORDS

Engagement; online student response systems; Socrative; Statistics

1. Introduction

Student engagement has been defined as how involved students are in their learning experience and how connected they feel to their classes, peers, and their institutions (Axelson and Flick 2010). Given the positive associations between student engagement, course satisfaction (Swan 2001; Wefald and Downey 2009), persistence (Berger and Milem 1999; Kuh et al. 2008), and academic success (Carini, Kuh, and Klein 2006), initiatives aimed at fostering student engagement in classrooms have become a primary focus for higher education institutions. As more and more technology becomes integrated into the student learning experience, educators have begun to explore technology-based initiatives as a means to enhance student engagement through facilitating active learning activities.

Previous research investigating the use of technology within higher education has demonstrated that using technology can enhance student engagement (D’Inverno, Davis, and White 2003; Poirier and Feldman 2007; Blasco-Arcas et al. 2013). The results of the 2016 Educause Center for Analysis and Research (ECAR) Study of Undergraduate Students and Information Technology Report (Brooks 2016) found that students believe that technology enriches their academic experience and is critical for academic success, indicating that students have welcomed the incorporation of technology-based learning strategies. Furthermore, recent reports have found that students are requesting classes to incorporate more technology (Dahlstrom and Bichsel 2014; Brooks 2016). Hence, there appears to be a need for universities to incorporate more technology into their teaching practices to satisfy the needs of today’s students. However, despite computers and technology becoming an integral part of delivering education, how best to exploit this potential to enhance student engagement remains largely unknown.

Student response systems (SRSs) are one such technology that has been promoted as having the potential to enhance student engagement in the classroom. SRSs are electronic tools which enable teachers to engage with students during a class by asking questions that can be answered instantaneously by large groups of students. Such systems are increasingly being employed by teachers and research has found that using such tools during classes can help increase student engagement (Hall et al. 2005; Fies and Marshall 2006; Caldwell 2007; Kaleta and Joosten 2007; Trees and Jackson 2007), partly due to the increased anonymity provided to students when responding to questions (Freeman, Blayney, and Ginns 2006).

Until recently, SRSs were predominately employed via handheld devices (e.g., “Clickers”) that teachers had to set up and distribute to students at the beginning of classes. Students would use the handheld devices to respond to multiple-choice questions displayed via a projector (Kay and LeSage 2009). However, rather than handheld devices, free online student response systems (OSRSs) are now available. In addition to the financial benefits of using these OSRSs as opposed to the “clicker” systems, these systems can be accessed by students using their own devices which is more convenient for students. An example of an OSRS is Socrative, which is an online tool that allows teachers to create questionnaires and quizzes and has the ability to collect student responses for analysis.

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mobile devices, provided that there is Internet access. To access an OSRS, teachers and students simply log on to a website or app on their own devices (e.g., a computer, laptop, tablet, or smartphone) to interact and respond to questions in real-time via the Internet.

An example of such an OSRS is Socrative (https://socrative.com/). Socrative enables teachers to create quizzes and other educational exercises that can help guide the focus of a particular lesson as well as generate discussions with students. The software empowers teachers to monitor and assess students' responses and progress in real time by giving them immediate feedback. This enables the teacher to identify areas that students are struggling with and adjust the pace or focus of a lesson accordingly. For example, when teaching students how to produce a piece of output for a particular statistical technique, teachers can administer a set of questions via Socrative to gauge their students' confidence in producing the output before moving on to the next activity, or if the results of the questions suggest it is necessary, dedicate more time to the current activity.

A previous controlled trial using a sample of engineering students reported mixed results for the OSRS, Socrative, finding that implementing the OSRS significantly increased student engagement, but had no significant effect on student performance (Dabbour 2016). Much of the previous research investigating OSRSs has predominately been feasibility-based though. Such studies have reported positive results with students typically reporting OSRSs to be easy to use and have a positive impact on their learning experience through enhanced levels of engagement and performance (Coca and Slisko 2013; Awedh et al. 2014; Dervan 2014; Mork 2014; Kaya and Balta 2016).

Although the results from these previous studies are encouraging, these studies tend to be limited in terms of their generalizability due to the use of post-test, uncontrolled research designs with non-randomized samples.

The use of Socrative has been investigated across a variety of disciplines including physics (Coca and Slisko 2013), physiology (Rae and O’Malley 2017), science (Wash 2014), sports management (Dervan 2014), computing (Awedh et al. 2014), English language (Kaya and Balta 2016), economics (Piatek 2014), and engineering (Dabbour 2016). Statistics courses are another area that may benefit from using Socrative given its potential positive effect on the student learning experience and considering that course evaluations by students taking statistics units tend to indicate poor engagement (Gladys, Nicholas, and Crispen 2012). To the authors’ knowledge, only one study has previously investigated the effect of Socrative specifically for statistics students. Balta and Guvercin (2016) found that the final grades of students enrolled in a statistics class who chose to engage with Socrative-based learning materials prior to their exam were significantly higher than the grades achieved by students who chose not to engage with the Socrative-based learning materials. Although this result is encouraging, the use of a non-randomized, post-test design means that we cannot confirm from this study that there is a beneficial effect for using Socrative, or if the difference in exam scores was due to underlying scholastic aptitude or motivation of the students who chose to engage with the OSRS. Hence, there is a need for further research exploring the use of Socrative specifically within statistics classrooms.

It is important that OSRSs are rigorously tested to ensure that they have the intended effect and are improving (or at least maintaining) the learning experience for students. Hence, there is a need for further, more methodologically rigorous research investigating the benefits of using OSRSs in the classroom. The aim of the current study was to investigate the integration of technology in a higher education setting. Specifically, the study aimed to examine the impact of using an OSRS (Socrative) within experimental conditions for a cohort of intermediate undergraduate statistics students. This study used both quantitative and qualitative data to assess the impact of Socrative. Firstly, a quantitative analysis was used to investigate the hypothesis that when exposed to the OSRS students would report greater levels of engagement with the curriculum content than when taught without exposure to the OSRS. In addition, a qualitative thematic analysis was used to further investigate what students did and did not enjoy about using the OSRS.

## 2. Methodology

The sample comprised of on-campus undergraduate students recruited from an intermediate-level statistics unit enrolled at a higher education institution located in Melbourne, Australia. The statistics unit is a core unit in the psychological sciences courses of the university and introduces students to fundamental statistical areas of research design and linear models. Specifically, the unit examines how multiple regression and analysis of variance (ANOVA) can be used to analyze data.

The experiment was based on a 2 (Time: Weeks 1–3 vs. Weeks 4–6) by 2 (pedagogical approach: Standard curriculum vs. Standard curriculum plus Socrative) mixed crossover design. Tutorials were conducted on-campus (i.e., in-person in computer labs). Tutorials are conducted once a week for the duration of the semester. A typical tutorial involves a tutor conducting a class for 120 min with a small group of students. Each of the five tutorial groups (of approximately $n = 15$ for each tutorial group) were randomly allocated into one of two groups: the intervention group and the control group. The intervention group’s tutorial classes utilized Socrative (in addition to the standard curriculum activities) for the first three weeks of the semester (i.e., Weeks 1–3) before engaging with just the standard curriculum (i.e., no Socrative use) for the next three weeks (i.e., Weeks 4–6) of the semester. The control group’s tutorial classes were exposed to Socrative in the opposite order (i.e., tutorial groups completed the standard curriculum without using Socrative for Weeks 1–3 before using Socrative in Weeks 4–6) (see Table 1). Hence, all students were exposed to the standard curriculum for half of the term and spent the other half of the term being exposed to the standard curriculum in addition to using Socrative. Throughout this time, all students were exposed to the same textbook and learning materials, the same tutor (author three; LT), as well as the same lecture and tutorial content (see Table 2 for a description of each week’s content). The only difference between the groups was the timing that Socrative was utilized in tutorials. An advantage of this type of design is that each participant acts as their own control, thus, reducing the influence of any confounding covariates.
Table 1. Visual representation of the crossover design.

| Time           | Intervention group       | Control group       |
|----------------|--------------------------|---------------------|
| Week 0        | Pretest                  | Pretest             |
| Weeks 1–3     | Standard curriculum + Socrative | Standard curriculum |
| End of Week 3 | Post-test                | Post-test           |
| Weeks 4–6     | Standard curriculum      | Standard curriculum + Socrative |

NOTE: The data collected only relates to all students responses on the pretest (i.e., before the teaching period commenced) and post-test (after the first three weeks of the teaching period). The cross-over component was only completed for the purpose of fairness (i.e., so that all students would have an opportunity to use Socrative). No actual data was collected at the end of this phase, as to avoid practice effects and other threats to internal validity.

Table 2. Summary of content covered in tutorial sessions.

| Week number | Content covered               |
|-------------|-------------------------------|
| Week 1      | Foundations of statistics     |
| Week 2      | Introduction to correlation and simple linear regression |
| Week 3      | Introduction to multiple regression |
| Week 4      | Part and partial correlations |
| Week 5      | Multiple regression report writing |
| Week 6      | Introduction to analysis of variance |

When exposed to the standard curriculum, students were presented with a statistical problem at the start of their tutorial sessions. This problem would relate to the content that was covered during an earlier lecture. The students would then work alongside their tutor to complete the presented problem. When students were exposed to Socrative, tutorials operated in a similar manner, however, Socrative was used in conjunction with the standard curriculum as a means to evaluate student learning. When students were presented with the initial question to solve, they were also asked to use Socrative to anonymously input their perceived ability in solving said problem (e.g., “Please rate your current knowledge of interpreting correlation output”). Students were instructed to use their computer to login to Socrative using a “room name” supplied by the tutor via the Student Socrative website (https://b.socrative.com/login/student/). The responses were instantaneously combined and displayed as a bar chart for the entire class to see via a projector (see Figure 1). The session would then proceed as per the standard curriculum, with the students working alongside the tutor to solve the problem. At the end of the tutorial session, the students were asked to complete the same Socratic question from the start of the tutorial, with the anonymous aggregate totals being displayed for the whole class to compare. Figure 1 provides an example of a question given to students during one of the tutorials. This example shows that 63% of students responded as having “Fair” or “Excellent” knowledge of the concept about to be tested in the tutorial and increasing to 94% responding “Fair” or “Excellent” after the tutorial. Similar results were observed for this type of question for each tutorial in this study. Socrative questions were created prior to each class and the same questions were used in each class that was being exposed to Socrative during that particular week (see, e.g., Appendix A questions).

One week prior to their first tutorial, participants were invited to complete an initial survey consisting of measures that examined academic engagement. Academic engagement was measured using an adapted version of the 9-item Utrecht Work Engagement Scale (UWES-9) (Schaufeli, Bakker, and Salanova 2006). Participants rated each item on a 7-point Likert scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). Scores were summed to produce a total engagement score with higher scores indicating greater levels of academic engagement. The UWES-9 has demonstrated good internal consistency and test-retest reliability (Schaufeli, Bakker, and Salanova 2006; Balducci, Fraccaroli, and Schaufeli 2010) and has been adapted to measure academic engagement in previous studies (Salmela-Aro et al. 2009).

The students then completed three weeks of either the Socrative or non-Socrative tutorial sessions, followed by a post-intervention survey consisting of the same measure described above (i.e., the academic engagement survey). Participants in the study group were also asked to respond to three open-ended qualitative items on the post-intervention survey. These items were: (1) What did you enjoy about using Socrative? (2) What did you dislike about Socrative? and (3) If you could change or improve anything about Socrative what would it be?

All students were required to complete the ethics-approved intervention activities during their respective tutorials, however, participation in the pre-post surveys was completed voluntarily. Any student who did not consent to participate in the research was not required to complete the surveys and their data was not included in the analysis. In total, eighteen valid survey...
responses were acquired for analysis. This research was carried out according to protocols approved by Swinburne University of Technology Human Research Ethics Committee (Project number: 2017/144).

3. Results

3.1. Quantitative Analysis

Descriptive statistics (means and standard deviations) for the individual items can be found in Appendix B. A total score (using listwise deletion to account for missing data) was computed for the two groups. Note: the listwise deletion resulted in \( n = 5 \) and \( n = 8 \) for the Standard and Socrative groups, respectively. Descriptive statistics comparing the two groups (after listwise deletion) for total academic engagement are shown in Table 3.

For students in the Socrative group, on average, academic engagement was higher on the post-test (\( M = 43.75, SD = 6.92 \)) than on the pretest (\( M = 40.38, SD = 10.93 \)). However, the results of a paired samples \( t \)-test revealed that this difference, \(-3.38\), was not significant, \( t(7) = 1.52, p = 0.17 \). Given this group’s relatively small sample size (\( n = 8 \) after removing non-responders listwise), non-parametric methods (Wilcoxon signed rank test) were also conducted to ensure consistency. Similar to the previous analysis, academic engagement between the pre- (Mdn = 43) and post- (Mdn = 45) tests did not differ significantly, \( T = 27.50, p = 0.18 \).

Academic engagement for students in the non-Socrative group, on average, decreased from the pretest (\( M = 42.60, SD = 7.44 \)) to the posttest (\( M = 41.40, SD = 7.13 \)). However, this difference (\( 1.20, BCa 95\% CI [−0.38, 6.61] \)) was not significant, \( t(4) = 0.41, p = 0.71 \). Similar to the previous group, a Wilcoxon signed rank test was conducted on this data. The results revealed no significant difference for academic engagement between pre- (Mdn = 40) and post- (Mdn = 45) tests, \( T = 5, p = 0.50 \).

Finally, a Mann–Whitney \( U \) test was conducted to compare the two groups across academic engagement (computed as a difference between pre and post measurements). The results revealed that the change in average academic engagement was not significantly different, \( U = 11.50, p = 0.21, BCa 95\% CI [−10.89, 3.13] \) between the two groups.

3.2. Qualitative Analysis

The qualitative responses were analyzed using an inductive thematic analysis method. The analysis followed the six-step method described by Braun and Clarke (2006): (1) data familiarization; (2) initial code generation; (3) theme searching; (4) theme revision; (5) theme definition and naming; and (6) reporting. A number of themes emerged from summarizing the qualitative data from each of the three open-ended questions included in the post-intervention survey. Each theme will now be discussed with direct quotes from participant responses.

3.2.1. Item 1: What Did You Enjoy About Using Socrative?

Three major themes emerged from summarizing the qualitative data for item 1 via the thematic analysis: (1) novelty, (2) evaluation of competence, and (3) fun.

3.2.1.1. Novelty. Students indicated that using Socrative provided a unique classroom experience. A number of students commented that they found the novelty of Socrative to be interesting, for example; “It was interesting seeing if I understood the content being discussed.”

3.2.1.2. Evaluation of competence. Another theme that was identified was the concept of evaluation of competence in comparison with others. Students expressed that they found it useful to see how others felt about the content being taught in the tutorials. For instance:

“I liked seeing how my feelings about the work compared with other students.”

“I liked it when everyone participated and the poll style questions showed the responses of the whole class. It was nice to see that other people had the same response as me.”

3.2.1.3. Fun. Many students expressed that they enjoyed using Socrative because it was more fun compared to their regular classes. For example:

“It was a fun way the lecturer used to engage with the whole class.”

“It was different to just sitting there and taking down notes—we got to interact.”

3.2.2. Item 2: What Did You Dislike About Socrative?

Two themes emerged from summarizing the qualitative data for item 2 via the thematic analysis: (1) relevancy and (2) none.

3.2.2.1. Relevancy. This theme revealed that some students believed the Socrative questions to be irrelevant to their learning experience. For example, one student commented that “Sometimes it felt like a bit of a waste of time,” while another said that it “Felt like time could have been better spent on something else.”

3.2.2.2. None. One third of students (33.3% of responses) commented that there was nothing they disliked about using Socrative.

| Group                                      | Median | M    | SD    | Median | M    | SD    | \( M_{\Delta} \) | SD_{\Delta} |
|--------------------------------------------|--------|------|-------|--------|------|-------|-----------------|-------------|
| Standard curriculum with Socrative        | 43     | 40.38| 10.93 | 45     | 43.75| 6.92  | −3.38           | 6.30        |
| Standard curriculum                        | 40     | 42.60| 7.44  | 41     | 41.40| 7.13  | 1.20            | 6.61        |
3.2.3. Item 3: If You Could Change or Improve Anything About Socrative What Would It Be?

The third item asked students to provide suggestions for how Socrative could be improved. Three themes emerged from the responses: (1) revision, (2) access, and (3) instructions.

3.2.3.1. Revision. Some students suggested that Socrative should be used as a revision tool to help revise the materials taught in lectures and tutorials commenting that the program “can be used to quickly review the material learned in previous lessons” while another suggested to “definitely use it as a revision tool…perhaps in tutorials. The tutor can ask a question and then everyone can give in their answers.”

3.2.3.2. Access. Other students indicated that they would have preferred to use the program via the app on their smartphones rather than via the web-browser on computers. For example, one student commented that “It would have been nicer if it was in an app,” while another suggested to “Maybe try and turn it into an app rather than using [a] web browser.”

3.2.3.3. Instructions. Finally, two students also indicated that more specific instructions were required—these responses did not make it clear whether these students were unable to navigate Socrative or whether they needed better instructions to solve the actual statistics problems they were presented with.

4. Discussion

The use of OSRSs is increasing within tertiary education providers with practice typically leading research on these tools. To bridge the gap between research and practice concerning the integration of technology in higher education, this study investigated the use of an OSRS (Socrative). The quantitative results provided insufficient evidence for an increase in academic engagement scores after being exposed to Socrative. However, the qualitative feedback received from students on the use of Socrative was positive.

The themes that emerged in response to the open-ended questions suggest that Socrative may be an appropriate tool to integrate more technology-based learning strategies that satisfy student requests for more interactive lessons (Dahlstrom and Bichsel 2014; Brooks 2016). Overall, students appreciated the introduction of novel active learning strategies into tutorial classes and perceived Socrative as having a positive impact on engagement by facilitating a fun and unique learning experience. While some in higher education are quick to dismiss such affective reactions to novel approaches to teaching as fun, it should be remembered that getting students enthused about learning statistics is a significant barrier that statistics educators are regularly faced with. Furthermore, given the challenges to fostering engagement in statistics classes due to students typically holding negative attitudes toward the discipline and perceiving the subject as an obstacle in the way of attaining their degree (Perney and Ravid, 1991; Gal and Ginsburg 1994), these results suggest that Socrative has potential to overcome issues specific to statistics units. This is encouraging news for educators who might be looking for novel ways to engage their students while delivering statistical-based content.

The qualitative findings also indicate that Socrative provides a welcomed opportunity for students to assess their perceived competence of course content learnt during class, and suggests that students appreciate being able to determine their level of comprehension in comparison to other students. This feedback was also beneficial for the teacher running the tutorial. The feedback provided from questions similar to the example shown in Figure 1 assisted the teacher to implement Just-in-Time Teaching (JiTT) by fine-tuning the tutorial activities to better meet the students’ needs. Using Socrative in this way has the potential for increasing the effectiveness of learning during tutorials.

This suggests that Socrative may be a worthwhile tool, particularly for statistics educators to consider using in online courses where students are often isolated from one another and are unable to make any comparisons between themselves and their peers. For example, online courses with a synchronous component (e.g., a weekly “live” online lecture) might consider using Socrative to run polls or quizzes, much like we did in our on-campus classes, to overcome isolation. Furthermore, the sense of anonymity afforded by SRSs (see Freeman, Blayney, and Ginns 2006) which also apply to OSRSs such as Socrative, may also see students more willing to express their opinions and participate in online class discussions. The novelty factor reported by students in the current study may also be true for online students which could also help with engagement in online classes. Future research should consider testing OSRSs like Socrative in online learning environments to investigate whether these tools are beneficial for online students and educators.

Students also reported that Socrative was easy to use. Given that modern students find browsing and navigating web pages to be a relatively simple task, it was to be expected that no major complications would arise from using a browser-based program. However, some students suggested that they would have preferred to engage in Socrative activities via an app rather than the web-browser. Socrative does offer an app that can be used by students in the same way that the web-browser is used. As such, it is suggested that educators consider enabling students to engage in Socrative via either the web-browser or the app.

The results from the qualitative analysis were not all positive, however, with some students questioning the relevance of the Socrative-based activities. This is a common critique noted in previous research investigating student response systems (see Aljaloud et al. 2015). This is a concern as students who find an activity irrelevant may quickly lose interest in the task and their attitudes toward the subject may become negative (Osborne, Simon, and Collins 2003). However, this problem is not unique to the use of SRSs with students in general desiring authentic learning activities that are applicable to the real world (Maina 2004).

Students did offer suggestions for how Socrative could be better used in the classroom, suggesting for it to be used as a revision tool. Previous research has suggested that using Socrative as a revision tool has the potential to help students revise and achieve higher exam marks (Balta and Guvercin 2016). Hence, in addition to using Socrative to assess student mastery of the content, educators should also consider creating multiple choice
quizzes via Socrative assessing student knowledge relevant to each lesson in preparation of upcoming assessment tasks.

The present study was not without its limitations. Firstly, due to the small sample size, the inferential statistics should be interpreted with caution. Despite the researchers’ best efforts to maximize participation (e.g., discussion boards posts, E-mails, lecture visits), overall, students did not appear interested in participating in the research itself (i.e., completing the questionnaires), hence, the small sample size. This is a common limitation amongst studies investigating OSRSs (e.g., Coca and Slisko 2013; Awedh et al. 2014; Dervan 2014; Mork 2014; Balta and Guvercin 2016; Dabbour 2016; Kaya and Balta 2016). A further limitation was the timing of the research. Students were only exposed to Socrative for three weeks of tutorial classes. This may not have been a long enough time for the OSRS to have an observable impact on engagement. Furthermore, students were administered the pre-post surveys within the first month of the teaching period. This is when engagement levels for students are typically at their highest (Stewart, Stott, and Nuttall 2011). Further study is needed to investigate the use of Socrative across multiple academic units (for a longer duration and across multiple time points) using large and heterogeneous samples to confirm a beneficial effect for using Socrative and for the results to be generalizable to the wider tertiary education sector. In addition to academic engagement, future research should look to quantify the effect of using OSRSs on student learning and course satisfaction.

By taking advantage of new educational technology, teachers can create a more active learning environment that assists students to have an enhanced learning experience (D’Inverno, Davis, and White 2003; Poirier and Feldman 2007; Blasco-Arcas et al. 2013). Hence, investigating and employing technology-based strategies that promote student engagement is an important initiative, especially when it comes to units like statistics, that can present educators with difficulties in regards to engaging students in the classroom. Taken together, the quantitative and qualitative results from the current study outline a clear path for future OSRS-related use in teaching and research on the effective use of these tools. It is hoped that the results from this study will encourage educators seeking to foster greater student engagement to consider incorporating OSRSs, like Socrative, into their teaching practices. However, before this technology can be widely adopted, further research is needed to confirm the presence and magnitude of the effect of OSRSs on the student learning experience. Further research is also needed to determine if and to what degree these improvements in engagement impact students’ performance as well as their attitudes and interest in statistics and related career pathways.

Appendix A: List of Example Questions Given to Students via Socrative

What is the strength and direction of the correlation?
Is multiple R significant?
Interpret the partial regression coefficient
How confident are you using SPSS to produce regression output?

Appendix B: Descriptive Statistics for the Pre- and Post-Survey Responses for Individual Academic Engagement Items

|                         | Pretest       | Post-test     | Δ     |
|-------------------------|---------------|---------------|-------|
|                         | M    | SD   | M    | SD    |     |
| **Standard curriculum with Socrative** |               |               |       |
| At school, I feel bursting with energy | 3.13 | 1.36 | 3.67 | 1.86  | 0.54 |
| At school, I feel strong and vigorous | 3.63 | 1.30 | 3.83 | 1.72  | 0.20 |
| I am enthusiastic about my school work | 4.75 | 1.75 | 5.17 | 1.17  | 0.42 |
| My school work inspires me | 4.63 | 1.85 | 5.17 | 0.41  | 0.54 |
| When I get up, I feel like going to school | 3.25 | 2.19 | 3.50 | 2.17  | 0.25 |
| I feel happy when I am working intensely at school | 5.25 | 0.46 | 5.67 | 1.51  | 0.42 |
| I am proud of the work that I do at school | 5.25 | 1.49 | 5.83 | 0.75  | 0.58 |
| I am immersed in my school work | 4.38 | 1.30 | 5.83 | 0.75  | 1.45 |
| I get carried away when I am working at school | 3.63 | 2.07 | 5.17 | 1.33  | 1.54 |
| **Standard curriculum** |               |               |       |
| At school, I feel bursting with energy | 3.50 | 1.41 | 3.88 | 1.55  | 0.38 |
| At school, I feel strong and vigorous | 3.88 | 1.25 | 3.38 | 1.69  | -0.50 |
| I am enthusiastic about my school work | 4.75 | 1.75 | 5.38 | 1.06  | 0.63 |
| My school work inspires me | 4.13 | 1.64 | 5.13 | 0.35  | 1.00 |
| When I get up, I feel like going to school | 4.00 | 2.14 | 3.88 | 1.96  | -0.12 |
| I feel happy when I am working intensely at school | 5.50 | 0.76 | 5.50 | 1.31  | 0.00 |
| I am proud of the work that I do at school | 5.50 | 1.60 | 5.88 | 0.64  | 0.38 |
| I am immersed in my school work | 4.75 | 1.49 | 5.63 | 0.74  | 0.88 |
| I get carried away when I am working at school | 4.38 | 1.85 | 5.13 | 1.13  | 0.75 |

NOTE: M = mean, SD = standard deviation, Δ = change in mean from pretest to post-test.
Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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