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Behavioural Dimensions of College Students' Intention to Implement Computational Thinking in Designing Spreadsheets for Accounting

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Abstract

This study aims to investigate the behavioural dimensions that influence college students' intention to implement computational thinking in compiling financial statements using spreadsheets. This study used a non-experimental type of quantitative research with a cross-sectional research design. The sample of this study was148 college students who will take part in learning spreadsheets on the topic of preparing financial statements at a university located in the central part of Java, Indonesia. This research instrument used questioner refers to the structure of Decomposed Theory of Planned Behaviour' Taylor & Tod (1995). Data validity is tested with convergent validity and discriminant validity, while data reliability is tested with composite reliability and Cronbach's alpha. PLS-SEM analysis with the help of Warp-PLS 7.0. The results show that attitudes (p-value < 0.01), subjective norms (p-value = 0.03), and perceived behavioural control (p-value < 0.01). Thus, attitudes, subjective norms, and perceived behavioural control were significant predictors of the college students' intention to implement computational thinking. This study provides empirical evidence that attitude, subjective norms, and perceived behavioural control influence college students' intention to implement computational thinking in spreadsheets learning. This research makes a practical contribution to educational practitioners in designing and evaluating the Theory Planned of Behaviour-based interventions.

Keywords: Behavioural dimensions, financial statements, attitudes, computational thinking.

Introduction

The role of spreadsheets in the business world has been widely discussed and researched. Spreadsheets have an important role in the accounting field (Gero & Levin, 2018). Considering that one of the basic competencies in a competency-based framework in accounting is technology (Schneider, Becker, & Berg, 2017). One of the technologies that must-have accounting education graduates is known as spreadsheets. In a global context, good spreadsheets skills and design are becoming the demands of the accounting profession (Frownfelter-Lohrke, 2017). Today, millions of people use and develop spreadsheets (Bock, Bøgholm, Sestoft, Thomsen, & Thomsen, 2020), and 80% of accounting educators utilize spreadsheets in their learning (Rackliffe & Ragland, 2016). Spreadsheets are also needed for college students studying accounting to handle workplace jobs (Schneider, et al., 2017). Yet, most spreadsheets users have minimal programming capabilities (Frownfelter-Lohrke, 2017). Programming skills of college students majoring in accounting science are relatively low compared to college students from computer science majors so the potential for spreadsheet errors of college students majoring in accounting science is relatively higher than college students majoring in computer science (Lawson, Baker, Powell, & Foster-Johnson, 2009).

This phenomenon is a challenge for the world of accounting education because the ability to utilize spreadsheets is a basic skill that must be possessed by college students in solving accounting cases (Lee, Shifflett & Downen, 2019), such as recording in journals, ledgers, balance sheets, balance sheets, financial statements, and other financial fields. Frownfelter-Lohrke (2017) asserts that there are often some mistakes in designing spreadsheets. Research in the United States explains that the errors found in designing spreadsheets are due to the lack of implementation of good spreadsheet design principles that trigger the emergence of errors. Spreadsheet errors are caused by not separating data and formula cells, entering fixed values into formulas, not identifying variables and not naming them, not paying attention to the use of absolute and relative addresses, skipping rows and columns in data groups/calculations to look neat so as to defeat excel goals, and not

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providing documentation related to how spreadsheets work (Frownfelter-Lohrke, 2017).

The U.S.A study identified 25 spreadsheets errors in five different organizations, such as 381 potential errors, of which 117 were mistakes made by spreadsheets developers, and found also cost $100 million in losses for errors in designing spreadsheets (Powell, Baker, & Lawson, 2009). The complexity of spreadsheets errors in accounting demands that college students be aware of the impact of spreadsheets errors (Schneider, et al., 2017). Given the magnitude of the impact of spreadsheets errors, then designing spreadsheets requires skills that support the use of technology, especially spreadsheets such as computational thinking. Computational thinking has long been introduced by Papert (1980) and then developed by Wing (2006).

Wing (2006) explained that computational thinking is one of the daily life abilities and not just the programming skills used by computer scientists. Computational thinking is the process and method used in operating systems, focusing on how people solve or research problems using computers, but also developing and identifying problems (Wing, 2008). Computational thinking does not necessarily require computers, but one can generate computational thought processes using computers (Wing, 2008) so that computational thinking can be implemented by college students who are not computer science majors. Grover & Pea (2013) emphasizes computational thinking as proficiency in adopting the mindset of computer scientists to solve problems.

Computational thinking is needed in the application development process, ranging from problem formulation skills to solving problems thoroughly (Tabesh, 2017). This indicates that computational thinking is needed in the spreadsheets design process which includes the process of determining outputs/reports, identifying the data needed to create outputs/reports, designing worksheets and formulas needed, incorporating data and formulas into relevant worksheets, testing spreadsheet design automation (Frownfelter-Lohrke, 2017). When computers are used in the system/application development process with data processing, editing, and presentation activities, instructors should provide support to college students to implement computational thinking skills in operating the design process efficiently (Kılıç, Gökoğlu, & Öztürk, 2020:2).

Five computational thinking have long been applied in programming activities such as abstraction, algorithm design, decomposition, evaluation, and generalization (Selby and Woodland, 2013; Tsai, Liang, & Hsu, 2020; Wing, 2006) so that it can be applied also during the spreadsheets design process. It is further explained that abstraction, is a pattern of thinking used to focus on information that is important to facilitate problem-solving; decomposition, is a pattern of thinking used to manage and decompose complex problems into small parts; algorithmic design, is a pattern of thinking used to plan the solution of problems by making systematic and detailed steps or procedures; evaluation, the thinking pattern used to find the best solution by comparing the available alternative solutions; generalization, a pattern of thinking used to formulate various alternative problem-solution patterns to solve similar problems (Tsai, et al., 2020). Thus, the implementation of these five computational thinking patterns is expected to facilitate the preparation of financial statements using spreadsheets and minimize spreadsheet errors.

Computational thinking is used to solve problems in various disciplines, one of which is the development of computer applications (Harangus & Katai, 2020). The role of computational thinking has been widely discussed and researched in science, technology, engineering, and mathematics learning (Tang, Yin, Lin, Hadad, & Zhai, 2020), but the understanding of computational thinking among certain people such as teacher-students is inadequate (Looi, Chan, Huang, Seow, & Wu, 2020). Research involving respondents from West Virginia, Georgia, and Oklahoma reported that when computational thinking and computing tools are very useful and relevant in their learning process it has a positive impact on their intention to integrate computational thinking in the learning process (Kale, Akcaoglu, Cullen, & Goh, 2018).

When computational thinking is considered unimportant but required to implement computational thinking, it will give rise to negative attitudes and self-efficacy toward the implementation of computational thinking (Rich, Larsen, & Mason, 2020). In other words, when the behavioural dimensions that affect student intentions tend to be negative, the tendency to implement computational thinking is relatively low. Therefore, the tendency of behavioural dimensions that influence the intention for the implementation of computational thinking needs to be analyzed in more depth so that the designed interventions can address the problem appropriately. Rich et al. (2020) investigated the behavioural dimensions that influence the implementation of computational thinking, such as attitude and self-efficacy. The behavioural dimensions in Rich et al. (2020) directly affect the implementation of computational thinking. This contrast with Ajzen's theory of planned behaviour (TPB) (1985).

Ajzen's TPB (1985) asserts that the dimension of behaviour that drives a person to perform certain behaviours is behavioural intention. Furthermore, Ajzen (1991) explained that intentions are influenced by behavioural dimensions, such as attitudes, subjective norms, and perceived behaviour control. This difference prompted researchers to try to explore behavioural dimensions based on Ajzen's (1991) TPB that influence college students' intentions to implement computational thinking in the context of spreadsheets learning. Ajzen's (1991) TPB was developed by Taylor & Todd (1995).

Taylor & Todd (1995) introduced the term Decomposed Theory of Planned Behavior (DTPB). Taylor & Todd (1995) developed the behavioural dimensions of TPB Ajzen (1991) primarily on the components of each dimension. DTPB Taylor & Todd (1995) emphasizes that (1) the dimension of attitude refers to a person's perception of the usefulness of performing certain behaviours (relative advantage), ease of doing certain behaviours (complexity), and compatibility of certain behaviours with needs (compatibility); (2) subjective norms refer to the extent to which peer and superior influence a person to perform certain behaviours; and (3) perceived behaviour control refers to how a person's self-efficacy in performing certain behaviours and how the role of facilities to encourage a person to perform certain behaviours. Referring to DTPB Taylor & Todd (1995), in this study, college students' intention to implement computational thinking in compiling financial statements using spreadsheets is predicted by college students' attitudes towards the implementation of computational thinking, subjective norms, and perceived behaviour control.

Student attitude towards the implementation of computational thinking refers to college students' assessment of the usefulness, ease, and compatibility of computational thinking implementations to compile financial statements using spreadsheets. Sadaf, Newby, & Ertmer (2012) found that there is a positive relationship between attitudes and intentions to use computer technology. Research Rich et al. (2020) also confirmed that a positive attitude towards the implementation of computational thinking influences the intention to implement computational thinking. Student attitudes towards the implementation of computational thinking, in this study, measured how college students assess the relative advantage, compatibility, and complexity of computational thinking.

Subjective norms describe college students' perceptions of how people's expectations are considered important to the implementation of computational thinking. The study outlined subjective norms into three groups: superior (lecturer), peer (peer), and teamwork (friend in one group). Teo (2009) found that subjective norms influence the intention to use technology. The third dimension of perceived behavioural control, this dimension describes college students' perception of their beliefs about the ease of implementing computational thinking and the availability of facilities such as technologies and resources that support the implementation of computational thinking. Self-efficacy is a person's perception of his belief in performing a behaviour (Bandura, 2010). Fewer barriers can lead to the confidence to perform a larger behaviour, thus positively influencing behavioural intentions to use technology (Taylor & Todd, 1995). Thus, this research provides empirical contributions to the behavioural dimensions that influence college students' intention to implement computational thinking in compiling financial statements using spreadsheets. The significant influence of behavioural dimensions on student intentions can be used as a basis for determining intervention targets to encourage the implementation of computational thinking in spreadsheets learning.

The aim of this study is to explore TPB constructs that influence college students' intentions to implement five computational thinking skills in compiling financial statements using spreadsheets for 1 month and their impact on spreadsheets learning developers in universities. Compiling financial statements using spreadsheets is part of spreadsheets lectures on accounting education. Therefore, this study focuses on college students majoring instead in computer science, specifically college students' accounting education because programming skills are relatively minimal, so they have the potential to make mistakes in designing spreadsheets. This theory-based research is needed to identify variables that impact college students' intention to implement computational thinking in compiling financial statements using spreadsheets and their impact on college spreadsheets learning professionals.

Method

Research Design

This study used a quantitative approach. This non-experimental type of quantitative research uses a cross-sectional research design. In the cross-sectional research design, data is collected from all or part of the population to help answer the research question (Olsen & St George, 2004:7). The cross-sectional design in this study studied the dynamics of correlation between behavioural dimensions and college students' intention to implement computational thinking in designing spreadsheets for the preparation of financial statements in 2021.

Sample

The sample of this study was college students aged 18-20 years, studying in the department of accounting education at a Sebelas Maret university located in the central part of Java, Indonesia. College students have a vocational high school background and a non-vocational high school. The researcher targets a convenience sample of around 150 accounting education students consisting of 65 students' vocational high school backgrounds and 85 college students' non-vocational high school backgrounds. There is no standard sample size requirement for structural equation models.

Data Collection Tools

This research instrument refers to the structure of DTPB Taylor & Tod (1995). The instrument for measuring the behavioural dimensions in this study was prepared based on ATCT criteria (Ajzen, 2006), namely Target, Action, Context, and Time (TACT) of the specific behaviour to be measured, in this study, the implementation of 5 computational thinking patterns is the action or activity or behaviour to be measured, college students are the target, design spreadsheets for financial reporting is context and for 1 month is time. The instrument items in the study used a 7-point semantic differential scale. Each TPB construct developed a minimum of three items referring to the DTPB Taylor & Tod parameter (1995). The average item score for each TPB construct is used to represent the overall construct score. The validity of the instrument is tested with convergent validity and discriminant validity, while the instrument reliability is tested using composite reliability and Cronbach's alpha through Warp-PLS 7.0 program.

These research instruments include demographic and descriptive items to characterize the sample. Participants were asked to report school origin, initial awareness of spreadsheet errors, initial awareness of computational thinking patterns, and early involvement in designing spreadsheets for the preparation of financial statements. Attitude is operationally defined as a student's perception of the usefulness, ease, and compatibility of five computational thinking patterns in designing spreadsheets for financial reporting for 1 month. Attitudes towards the implementation of computational thinking were measured using eight statement items with overall construction scores ranging from 8 to 56.

Subjective norms are operationally defined as a college student's perception of the support of important people for college students to implement five computational thinking patterns in designing spreadsheets for the preparation of financial statements for 1 month. Subjective norm construction is measured by three statement items with an overall construction score range between 3 to 21. Perceived behaviour control is operationalized as a student's perception of the extent of college students' confidence in facility support, resources, and ease of implementing five computational thinking patterns in designing spreadsheets for the preparation of financial statements for 1 month. This construction is measured by five statement items and the construction score range is 5 to 35. Behavioural intention is defined as a student's intention or readiness to implement five computational thinking patterns in designing spreadsheets for the preparation of financial statements for 1 month. This construction is measured by three statement items with a construction score ranging from 3 to 21.

Data Collection

The data collection is carried out by spreading questionnaires consisting of 19 statement items referring to Taylor & Todd's (1995) DTPB structure (see Appendix). Researchers contacted the lecturer's spreadsheets course via social media (WhatsApp) and asked permission to conduct online research. Researchers provide an overview of the research and the time required. Before the instrument is shared with the sample electronically through Google Form, the researcher provides information related to the study, including the benefits, and voluntary nature of the study, the results will be confidential and present only group data. An explanation of computational thinking in a spreadsheets classroom can be seen in table 1.

Data Analysis

The data analysis in this study used PLS-SEM. PLS-SEM is used to analyse the behavioural dimensions that influence college students' intention to implement computational thinking patterns in compiling financial statements using spreadsheets and describe their impact on professional learning spreadsheets. The model was created through the Warp-PLS 7.0 program. PLS-SEM analysis begins by involving testing measurement models (outer models) that meet reflective criteria, namely convergent validity tests (loading factors and AVE values), and discriminant validity tests (cross-loadings and square roots AVE), and reliability tests (composite reliability and Cronbach's Alpha). If the measurement model meets all the necessary criteria, then the researcher assesses the structural model (inner model). In assessing structural

Table 1: Computational thinking in spreadsheets Classroom

Computational thinking	Lecturer Role	Students Activities
Abstraction	Ask and guide college students to analyze errors or deficiencies in the spreadsheets provided by the lecturer.	Focus on finding errors or deficiencies in the spreadsheets shared by lecturers
Decomposition	Ask and guide college students to describe errors or deficiencies found	Breaking down spreadsheets design errors or deficiencies into smaller parts
Generalization	Asking and guiding college students to find various alternative solutions to correct spreadsheet design errors	Access social media to look for various alternative solutions to correct errors or deficiencies that have been found
Evaluation	Ask college students to choose the best alternative from the various alternatives found	Make a decision to choose the best alternative solution
Algorithmic	Ask college students to describe the solution in sequential and detailed steps. Ask college students to input the solution steps into the worksheets	Describe the solution in sequential and detailed steps. Input the solution steps into the worksheets

models, researchers looked at R^2 values, fit models, and quality indexes. The R^2 value is used to test the predictive relevance of the model, that is, to determine the degree of variance of endogenous variables described by exogenous variables. Once the fit model and quality index are accepted, the next step is to test predictive validity through modelling structural equations by applying TPB constructions, namely attitudes, subjective norms, and behaviour control perceived as exogenous variables and behavioural intentions as endogenous variables.

Findings

There were 150 respondents of college students' accounting education who participated in the study, but there were two respondents who were excluded from the analysis for not completing the item properly, so the final sample of this study was 148 respondents. More than half of the sample (56.1%; n=83) were from non-vocational high school backgrounds. All samples did not yet understand the principles of good spreadsheet design (100%; n=148) so their initial awareness of spreadsheets' errors was relatively low. Their experience of learning spreadsheets while still in vocational high school (43.9%; n=65) only followed the instructions of their teachers, namely compiling financial statements using spreadsheets designed by teachers. College students do not get the opportunity to design spreadsheets according to the desired characteristics of the company. More than half of the sample (56.1%; n=83) had never utilized spreadsheets for the preparation of financial statements. This shows that the skills of most college students regarding the preparation of financial statements using spreadsheets are still relatively low.

Table 2 shows that (1) most college students have an attitude towards the implementation of computational thinking that is relatively high, meaning that college students feel that the implementation of computational thinking is useful, easy, and

Table 2: Description of Behaviour Dimensions Level

		Score, n=148		
TPB Constructs	*Mean*	*1-2 (Low)*	*3-5 (Medium)*	6-7 (High)
Attitude (AT)	42.33			
AT1		-	29.05%	70.95%
AT2		-	37.16%	62.84%
AT3		-	20.27%	79.73%
AT4		-	26.35%	73.65%
AT5		-	24.32%	75.68%
AT6		-	18.92%	81.08%
AT7		-	32.43%	61.57%
AT8		-	20.27%	79.73%
Subjective Norm (SN)	17.65			
SN1		-	41.22%	58.78%
SN2		-	21.62%	78.38%
SN3		-	28.38%	71.62%
Perceived Behavioural Control (PBC)	27.61			
PBC1		-	21.62%	78.38%
PBC2		0.66%	64.19%	35.15%
PBC3		-	52.70%	47.30%
PBC4		-	46.62%	53.38%
PBC5		-	56.76%	43.24%
Behavioural Intention (BI)	17.81			
BI1		-	23.65%	76.35%
BI2		-	33.78%	66.22%
BI3		-	35.14%	64.86%

compatible with the activity of compiling financial statements using spreadsheets, (2) the subjective norms of most college students are also relatively high meaning that college students feel that the implementation of computational thinking will have the support of people who are considered important, such as college friends, lecturers, and teamwork. In this case, support from lecturers becomes the highest choice means that college students feel that lecturers' recommendations to implement computational thinking are needed, (3) Perceived behavioural control college students show confidence that varies between medium and high. In this case, most college students feel confident enough to be able to implement computational thinking despite many other tasks whose collection time is the same, and (4) most college students have a desire for implementation, a desire to strive, and a desire to plan the implementation of computational thinking.

Measurement Model (Outer Model)

Convergent validity is acceptable if loading ≥ 0.5 (Kock, 2015; Kock & Lynn, 2012). Table 3 shows all loading factors ≥ 0.5, so convergent validity in this model is accepted. The results of the discriminant validity test can be seen from the cross-loadings and square roots of AVE. Cross loading is lower than the loading factor and the square roots AVE is higher than the latent variable in the same column, so the discriminant validity of this model is accepted.

Reliability is acceptable if the composite reliability coefficient (CR) and Cronbach's alpha (CA) coefficient > = 0.7. The results of the calculation (see Table 3) show all the coefficients of CR and CA > = 0.7, so it can be concluded that the instrument is accurate, consistent, and precise in measuring the construct. Based on the results of convergent validity analysis, discriminant validity and reliability show that the measurement model meets all the necessary criteria, hence the next step of assessing the structural model (inner model).

Assessing Structural Models (Inner Models)

Assessing structural models is done by looking at the value of R2, fit model, and quality index. The R2 value obtained from the analysis results is 0.656, meaning that 65.6% of the

Table 3: Results of Validity and Reliability Calculations

TPB Constructs	*Factor Loading*	*Square roots AVE*	Composite reliability coefficients	Cronbach's alpha coefficients
Attitude (AT)		0.827	0.945	0.933
AT1	0.761			
AT2	0.763			
AT3	0.874			
AT4	0.843			
AT5	0.854			
AT6	0.879			
AT7	0.731			
AT8	0.898			
Subjective Norm (SN)		0.859	0.894	0.822
SN1	0.836			
SN2	0.834			
SN3	0.907			
Perceived Behavioural Control (PBC)		0.786	0.889	0.843
PBC1	0.719			
PBC2	0.741			
PBC3	0.789			
PBC4	0.887			
PBC5	0.782			
Behavioural Intention (BI)		0.865	0.899	0.832
BI1	0.835			
BI2	0.875			
BI3	0.885			

variance of BI variables is explained by the AT, SN, and PBC variables. Based on WarpPLS 7.0 external results show that the a priori set on the satisfactory goodness-of-fit for the model is fulfilled, including the APC value of $p < 0.001$; ARS of $p < 0.001$; AARS of $p < 0.001$; AVIF = 2,309; AFVIF = 2,685; GoF = 0.677; SPR = 1; RSCR = 1; SSR = 1; and NLBCDR = 1. Thus the fit model and quality index are accepted so that they can assess the behavioural dimensions that affect college students' intentions to implement computational thinking in designing spreadsheets for the preparation of financial statements through modelling structural equations, namely applying attitudes, subjective norms, and perceived behavioural control as exogenous variables and behavioural intentions as endogenous variables. The SEM model (see Figure 1) shows that AT($p < 0.01$), SN ($p = 0.03$) and PBC ($p < 0.01$) are significant predictors of behavioural intentions.

The findings of this study provide information that behavioural intentions to implement computational thinking skills are influenced by attitude dimensions towards the implementation of computational thinking, subjective norms, and perceived behavioural control (65.6%) and these three predictors are significant predictors of the intentions of accounting education students to implement computational thinking skills in designing spreadsheets. Thus, attitudes, subjective norms, and perceived behavioural control are behavioural dimensions that influence college students' intention to implement computational thinking in designing spreadsheets for the preparation of financial statements.

Discussion

The experience of college students with an educational background from non-vocational high schools in designing spreadsheets for the preparation of financial statements is relatively low. All samples are not yet familiar with the general principles of good spreadsheet design so they are unaware

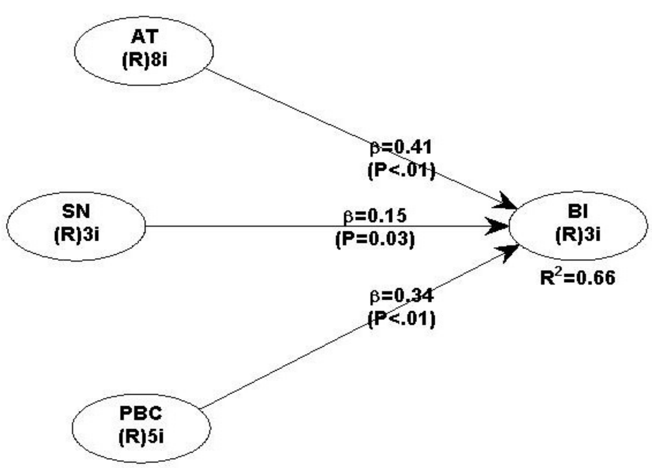

Fig. 1. SEM Model from Print Out WarpPLS 7.0

of whether the design they are using is accurate or prone to errors. In addition, the experience of college students with an educational background from vocational high school when studying spreadsheets at a time in vocational high school only follows the instructions of their teachers, namely compiling financial statements using spreadsheets designed by teachers. Interventions to improve college students' understanding of the principles of good spreadsheet design can be done by involving college students in idealizing errors in designing spreadsheets in reference to the principles of good spreadsheet design (Frownfelter-Lohrke, 2017).

There are six principles of good spreadsheet design according to Frownfelter-Lohrke (2017) including first, separating data and formula cells as data changes from period to period and for integrity and reducing errors due to overwriting. The second principle is not to enter the fixed value "hardcoded" into the formula, for example, entering the formula =0.10*B2 into cell C2 is not allowed, 0.01 must be placed in a different cell for example in cell A1, so that if at any time there is a change in data then it is enough to change the nominal in cell A1 alone this will be more effective. The third principle identifies variables and names them, for example, in the case example in the second principle, the user can name cell A1 containing 0.01 as interest_rate, then the formula that should be written in cell C2 = interest_rate*B2. The naming of a cell indicates that the name and the cell are an absolute reference, meaning that each time you use that name it will refer to the cell according to that name. The fourth principle, understand the use of absolute and relative addresses because if one does not understand how, it works will lead to errors. The fifth principle, do not to miss rows and columns in data groups/calculations because this software is designed to treat data or calculations in congruent rows and columns as shared property (range), preferably expanded columns or rows if perceived to require a lot of space. Principle six provides documentation that includes what spreadsheets do to remember how spreadsheets are created.

College students' experience of accounting education towards the implementation of computational thinking can be improved by involving college students in computational thinking-based spreadsheets design activities by conveying the design errors of spreadsheets found, designing solutions to overcome design errors, implementing solutions that have been designed, evaluating solutions (Schneider, et al., 2017). In addition, computational thinking skills can be integrated into semester learning plans or lecture contracts. In addition, the experience of the sample implementing computational thinking skills to solve problems is also low, they have never been involved with the computational thinking process in solving accounting cases before participating in this research. This phenomenon shows that teaching computational thinking to college students is a big challenge (Zha, Jin, Moore & Gaston, 2019). These findings suggest that learning spreadsheets should focus on improving student experience and engagement towards the implementation of computational thinking in designing spreadsheets.

Attitude Towards the Implementation of Computational Thinking

An average attitude score of 42.33 (SD = 5.14), with a range of 8-56, indicates that college students have a relatively high positive attitude to behavioural intentions to implement computational thinking skills in designing spreadsheets for a period of 1 month. In addition, attitude ($p < .01$) is a statistically significant predictor of behavioural intentions for implementing computational thinking skills in designing spreadsheets for 1 month. These results support Ajzen's TPB, where attitudes towards certain behaviours will influence the individual's behavioural intentions. So, college students' positive attitudes towards the implementation of computational thinking can be used as a target for intervention in future research. Participants had a positive attitude towards the implementation of relatively high computational thinking skills, meaning that they felt that computational thinking skills were easy to implement, had benefits, and were compatible with designing spreadsheets so the more likely the implementation of computational thinking skills was adopted. These findings are in line with research reporting that when computational thinking is considered useful and relevant, it will provide the impetus to implement computational thinking in learning (Kale, Akcaoglu, Cullen, & Goh, 2018).

Subjective Norms

The average subjective norm score is 17.65, with a range from 3-21, which indicates that the social pressure college students feel to implement computational thinking in designing spreadsheets is relatively high. Subjective norms are also predictors ($p = .03$) of behavioural intentions to implement computational thinking in designing spreadsheets. This finding is in line with research that states that when people who are considered important agree to do certain behaviours it will be a big boost to the intention to do such behaviour (Taylor & Todd, 1995). The findings of this study suggest that interventions designed to implement computational thinking in designing spreadsheets should target subjective norms. The high social pressure felt by college students indicates that they feel that lecturers, group teams, and college friends will approve college students to implement computational thinking in designing spreadsheets. Research reports that lecturer recommendations are the strongest predictor for college students. Therefore, designed interventions require the involvement of lecturers in encouraging accounting education students to implement computational thinking skills in designing spreadsheets.

Perceived Behaviour Control

The average perceived behaviour control score was 27.61 (SD = 3.66) with a range from 5-35, which indicated that college students' confidence in their ability and sense of control to implement computational thinking in designing spreadsheets for 1 month was relatively high. This shows that college students strongly believe in their ability to implement computational thinking in designing spreadsheets because they have laptops and spreadsheets that are suitable for the implementation of computational thinking. Although many other tasks with the same collection time, they are quite confident of being able to implement computational thinking in designing spreadsheets. In addition, perceived behaviour control is also a significant predictor ($p <.01$) of behavioural intentions in structural models. These findings are in line with research reporting that self-efficacy as a predictor of the implementation of computational thinking skills (Rich, et al., 2020) and the availability of technology and resources that are easy and relevant will give rise to a greater belief in performing a behaviour, thus positively affecting behavioural intentions (Taylor & Todd, 1995). The study's findings suggest that interventions designed to implement computational thinking in designing spreadsheets for 1 month should target perceived behavioural control.

Intentions for the Implementation of Computational Thinking

Overall, the sample had a high behavioural intent (M = 17.81, SD = 2.17) to implement computational thinking in designing spreadsheets for 1 month, based on a possible range of 3–21. The findings were not particularly surprising because the samples had attitudes, subjective norms, and perceived behavioural control were also relatively high. The intention of implementing computational thinking is relatively high in this sample is possible because college students have been explained the benefits of implementing computational thinking before filling out the instrument. College students have been briefed on several digital age skills that can be improved through the implementation of computational thinking in spreadsheet design. The digital age skills that can be enhanced through the implementation of computational thinking include creativity, algorithmic thinking, collaboration and communication, critical thinking, and problem-solving (Durak & Saritepeci, 2018; Günbatar & Bakirci, 2018; Korkmaz, et al., 2017; Saritepeci, 2019; Yagci, 2018). Therefore, in order to promote the implementation of computational thinking skills in designing spreadsheets by asking participants to indicate when, where, and how they plan to implement computational thinking in designing spreadsheets.

Conclusion

The study offers new information on intrapersonal factors that influence college students' behavioural intentions to implement computational thinking in designing spreadsheets for the preparation of financial statements. Attitudes towards the implementation of computational thinking, subjective norms, and perceived behavioural control may be targets in interventions designed to support the intention of implementing computational thinking skills among college students. Most college students are not yet familiar with the principles of good spreadsheet design, which will risk making mistakes in designing spreadsheets. Therefore, interventions that promote the implementation of computational thinking in the learning of spreadsheets for college students are indispensable to teaching good spreadsheet design. Behavioural intentions to implement computational thinking are relatively high among the sample, it is possible because college students have been explained the benefits of implementing computational thinking and introduced to the concept of computational thinking.

Suggestion

Suggestions for educational practitioners, they can use the instruments in this study to design and evaluate TPB-based interventions to promote the implementation of computational thinking skills in spreadsheets learning among college students. In addition, the findings of this study can be used to identify the implementation messages of appropriate computational thinking skills, such as messengers (e.g., lecturers, peers, close friends of lectures), Settings (e.g., traditional classes, computer labs, websites, social media, facilities) and modalities (e.g., lectures, videos, group discussions, creating artefacts, demonstrations) for the design of computational thinking implementation interventions targeting college students. accountancy. The findings of this study are urgently needed to develop interventions that consider specific aspects of psychology that include attitudes towards the implementation of computational thinking skills, subjective norms, and perceived behavioural control in future studies. In addition, future research may investigate the possibility of mediators and moderators of TPB construction to investigate in more detail the factors that influence the implementation of computational thinking. These findings will be very helpful in qualitative research for future research by investigating further: (a) how planning is made by college students to implement computational thinking, and (b) how college students try to carry out the planning that has been made in the next 1 month.

Limitation

The use of a cross-sectional design has several limitations, such as the possibility of respondent errors in interpreting these items, susceptible to sampling bias because all respondents were taken by convenience sampling, tended to be response bias and limited generalization because most of the respondents were accounting education students. This study does not discuss interpersonal, economic, environmental, or political factors as variables that influence college students' intention to apply computational thinking.

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Appendix

TPB Constructs	*Items*
Attitude (AT)	
AT1	I'm thinking of implementing the five computational thinking patterns in designing spreadsheets/Excel for preparing financial statements Very Innovative – Very Not Innovative
AT2	I'm thinking of implementing the five computational thinking patterns in designing spreadsheets/Excel for preparing financial statements Very Accurate – Very Inaccurate
AT3	I'm thinking of implementing the five computational thinking patterns in designing spreadsheets/Excel for preparing financial statements Very Needed – Very Unnecessary
AT4	I'm thinking of implementing the five computational thinking patterns in designing spreadsheets/Excel for preparing financial statements Very Meaningful – Very Meaningless
AT5	I'm thinking of implementing the five computational thinking patterns in designing spreadsheets/Excel for preparing financial statements Very Helpful in Finding Solutions – Very Difficult in Finding Solutions
AT6	I'm thinking of implementing the five computational thinking patterns in designing spreadsheets/Excel for preparing financial statements Very Useful – Very Useless
AT7	I'm thinking of implementing the five computational thinking patterns in designing spreadsheets/Excel for preparing financial statements Minimizing Errors – Vulnerable to Errors
AT8	I'm thinking of implementing the five computational thinking patterns in designing spreadsheets/Excel for preparing financial statements Very Easy – Very Difficult
Subjective Norm (SN)	
SN1	My colleagues want me to implement the five computational thinking patterns in designing spreadsheets/Excel for preparing financial statements Strongly Agree – Strongly Disagree
SN2	My lecturer wants me to implement the five computational thinking patterns in designing spreadsheets/Excel for preparing financial statements Strongly Agree – Strongly Disagree
SN3	My teammates want me to implement the five computational thinking patterns in designing spreadsheets/Excel for preparing financial statements Strongly Agree – Strongly Disagree
Perceived Behavioural Control (PBC)	
PBC1	I believe can implement the five computational thinking patterns in designing spreadsheets/Excel for preparing financial statements within one month Very Confident – Very Uncertain
PBC2	I believe can implement the five computational thinking patterns in designing spreadsheets/excel for preparing financial statements within one month Very Easy – Very Difficult
PBC3	For me, the control needed to implement the five computational thinking patterns in designing spreadsheets/Excel for preparing financial statements within one month Full Control – No Control
PBC4	Although it takes a lot of time, I believe can implement the five computational thinking patterns in designing spreadsheets/Excel for preparing financial statements within one month Very Confident – Very Unconfident
PBC5	Although many assignments have the same timeframe, I believe can implement the five computational thinking patterns in designing spreadsheets/Excel for preparing financial statements within one month Very Confident – Very Unconfident

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TPB Constructs	*Items*
Behavioural Intention (BI)	
BI1	I want to implement the five computational thinking patterns in designing spreadsheets/Excel for preparing financial statements within one month Strongly agree – Strongly disagree
BI2	I try to implement the five computational thinking patterns in designing spreadsheets/Excel for preparing financial statements within one month Strongly Agree – Strongly Disagree
BI3	I plan to implement the five computational thinking patterns in designing spreadsheets/Excel for preparing financial statements within one month Strongly agree – Strongly Disagree